Georgia Water Supply Redundancy Study
Middle Chattahoochee Water Planning Region
Georgia Environmental Finance Authority (GEFA)

Prepared for:

Georgia Environmental Finance Authority

REVISION NO. 0

Georgia Water Supply Redundancy Study

April 14, 2022

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Acronyms

ACF	Apalachicola-Chattahoochee-Flint
ACT	Alabama-Coosa-Tallapoosa
ADD	Average Daily Demand
ASR	Aquifer Storage and Recovery
DIP	Ductile Iron Pipe
EPD	Environmental Protection Division
FERC	Federal Energy Regulatory Commission
GEFA	Georgia Environmental Finance Authority
GSWCC	Georgia Soil and Water Conservation Commission
MGD	Million Gallon(s) Per Day
MNGWPD	Metropolitan North Georgia Water Planning District
QWS	Qualified Water System(s)
RWP	Regional Water Plan
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
Wood	Wood Environment & Infrastructure Solutions, Inc.
WSIRRA	Water System Interconnection, Redundancy, and Reliability Act
WTP	Water Treatment Plant

1.0 Introduction

In May 2010, the Water System Interconnection, Redundancy, and Reliability Act (WSIRRA) was signed into law (Senate Bill 380). A main goal of the Act was to identify and increase interconnections and redundancies for the Metropolitan North Georgia Water Planning District (MNGWPD). With this Act, Georgia affirmed the importance of comprehensive water emergency planning and the value of effectively sharing our current water resources through well-considered redundancy and interconnection planning. While the Act did not apply to water planning regions outside of the MNGWPD, its concepts and framework are useful for emergency planning throughout Georgia.

The Georgia Environmental Finance Authority (GEFA), through the services of Wood Environment & Infrastructure Solutions, Inc. (Wood), conducted a study identifying opportunities for water supply redundancy for qualified water systems (QWS) outside the MNGWPD. For the purposes of this report, a QWS is a public water system owned and operated by a city, county, or water authority that serves a total population (retail plus consecutive populations served) greater than 3,300. This report details the Middle Chattahoochee Water Planning Region, which consists of 11 counties in west-central Georgia, as shown in Figure 1-1. GEFA identified 15 QWS in the Middle Chattahoochee Region, as shown in Figure 1-2.

1.1 Purpose

The purpose of the Water Supply Redundancy Study is to increase Georgia's water supply solvency and reliability. This study evaluates drinking water supply, demand, treatment, storage, distribution, and interconnectivity to identify redundant water supply sources capable of providing backup water supply for each QWS.

Emergency scenarios were evaluated consistent with similar emergency supply planning projects in the state, such as the GEFA Water System Interconnection, Redundancy and Reliability Act Emergency Supply Plan (CH2MHill, Jacobs, Lowe Engineers, 2011) for the MNGWPD. These emergency scenarios include:

- Failure of largest treatment facility within a planning region
- Short-term catastrophic failure of distribution system
- Short-term contamination of a raw water source
- Failure of an existing dam of a raw water source
- Water supply reduction due to drought

Potential interconnection and redundancy projects were identified and prioritized. Each planning-level potential project includes the steps required to modify a QWS's operation and infrastructure to share water with adjacent water providers. Wood developed a decision-based prioritization tool that summarizes the specific system deficiencies (in volumetric demand) from emergency situations and quantifies emergency supply goals. The prioritization tool highlights available emergency water supply and deficits under existing and future conditions. Potential projects were prioritized and recommended based on performance using weighted quantitative and qualitative criteria.

1.2 Study Approach

An overview of each step of the study approach is outlined below.

1.2.1 QWS Data Collection

A detailed questionnaire and data request list were developed to collect data from each QWS. The questionnaire included general system data, water demand and usage, infrastructure and supply, and other planning information. QWS were contacted to conduct a follow-up interview. The results of the survey and interview were tabulated and reviewed. Study participation was optional. Some QWS opted to not participate or to partially participate. If data were unavailable or incomplete, professional reasoning was used to recommend a technically-sound approach for dealing with missing or incomplete data, including use of publicly available data.

1.2.2 Redundant Water Supply Sources

The collected survey data and additional information gathered from other sources, such as the Georgia Environmental Protection Division (EPD), regional water plans (RWPs), and the *GEFA Georgia Inventory and Survey of Feasible Sites for Water Supply Reservoirs* (MACTEC, 2008) report served as the foundation to evaluate sources of water supply capable of providing redundant supply for each QWS. Such water sources include raw and potable water sources, interconnections between systems, and excess capacity of current allocations. These identified water supply sources were pre-screened for their potential to serve regional or multi-jurisdictional water needs. Where sufficient information was available, quantitative screening criteria were used to compare sites and, where quantitative information was not readily available, qualitative evaluation and professional reasoning were used for the initial screening. These locations and other nearby stream networks were examined at a planning-level scale, taking into consideration issues such as current and/or future hydrographs, low-flow conditions, stream capacity, downstream non-depletable flow requirements, water quality, pumping and transmission requirements, permitting requirements, treatment requirements, and cost.

1.2.3 Emergency Planning Benchmarks

The QWS average daily demand (ADD) obtained from the data collection process was used to quantify tiered emergency supply goals within each system. This method highlights where full supply of demand may not be available during some emergency scenarios although reduced critical needs can be met by another system. For consistency with the MNGWPD study, the following reliability targets were used:

- 100% ADD
- 65% ADD
- 35% ADD

It is assumed that the 35% and 65% reliability targets correspond to estimated usage associated with essential water needs. GEFA has identified customers with essential water needs as hospitals, nursing home/assisted living facilities, correctional facilities, critical industries, and schools.

1.2.4 Water Supply Risk Evaluations

To carry out the preliminary screening, specific system deficiencies (in volumetric demand) of the emergency scenarios and supply goals within the focus area were calculated. The purpose of this is to highlight available emergency supply and deficits under existing and future conditions. The reliability targets were applied to each QWS under specified emergency situations to evaluate the capability of a QWS to supply sufficient water during that emergency. Deficiencies (in volumetric demand) from emergency situations were quantified for each QWS. In addition, the maximum deficit (Critical Scenario Deficit) was determined for each QWS.

1.2.5 Evaluation of Potential Projects

Potential redundancy projects were conceptualized for QWS experiencing deficits. These projects may include infrastructure redundancy, new interconnections, and upgrades to existing interconnections. Planning-level costs were estimated for potential redundancy projects based on RSMeans (a construction cost estimating software) or manufacturer prices.

1.2.6 Recommended Projects

Using a decision-based prioritization tool, absolute and weighted scores were calculated for each option. The options were then ranked using defined criteria (e.g., cost, environmental impacts). A sensitivity assessment was undertaken to test the influence of the category weightings on the rank outcome. Potential projects were then prioritized based on performance under these weighted quantitative and qualitative criteria.

2.0 QWS Data Collection

Detailed information about each QWS was obtained via a survey-based questionnaire, follow-up interviews, publicly available documents, information supplied by EPD, and data provided by the QWS.

2.1 Data Request

Each QWS was sent a standardized questionnaire approved by GEFA. The general categories are listed as follows:

- General system data (e.g., facility type, ownership type, and population served)
- Customer information (e.g., number of customers and critical facilities served)
- Water source information (e.g., source type and capacity, purchased water information, and water sales information)
- Permit conditions and limitations
- System infrastructure data (e.g., storage, treatment, and distribution data)
- System interconnection data
- Future planning considerations

Each QWS was also sent a data request list approved by GEFA, as follows:

- Master Plan
- Capital Improvement Plan
- Water Withdrawal Permits (both groundwater and surface water withdrawal)
- Public Water System Operating Permit(s)
- Surface Water and Groundwater Withdrawal Values (2015 through 2019)
- Sanitary Surveys (2015 through 2019)
- Water Sale Documents
- Emergency Planning Documents
- Mapping Information

2.2 Current and Future Conditions

For this study, 15 QWS in the Middle Chattahoochee Water Planning Region were surveyed. Economic sectors in this region include professional and business services, education, healthcare, manufacturing, and recreation. Land cover in the region is composed of approximately 58% forest, 14% row crops/pasture, 8% urban, 4% wetland, 3% water, and 13% other (Middle Chattahoochee Water Planning Council, 2017).

2.2.1 General System Information

Table 2-1 shows key general information about the 15 QWS. The QWS in this region serve primarily municipal customers, and to a lesser extent, industrial customers. Water for agricultural purposes is almost exclusively obtained from private sources, such as private wells. The Hogansville QWS serves the smallest total population and is a wholesale purchaser while the Columbus QWS serves the largest total population and has two surface water supply sources.

Findings from data collection include the following general information about the Middle Chattahoochee Region:

- One QWS (Cuthbert) has groundwater-only drinking water sources.
- Nine QWS have surface water-only drinking water sources.
- Two QWS (Carroll County and Haralson County) have groundwater and surface water drinking water sources.
- Three QWS (Hogansville, Tallapoosa, and Temple) are purchase-only systems that do not have raw water sources.
- Distribution systems range from approximately 17 years old to over 100 years old, with 8 systems over 70 years old. Two QWS are of an unknown system age.
- The largest system customers are typically industries, educational facilities, correctional facilities, and critical care facilities (e.g., hospitals). However, other public water systems are large customers for Carroll County, Columbus, Haralson County, Heard County, Hogansville and LaGrange.
- Nine QWS regularly purchase water from other public water systems.
- Nine QWS have at least one backup power source/facility.
- Three systems reportedly have current distribution system flow surplus capabilities.
- The following system interconnections, including emergency interconnections, were reported:
    - Bowdon is interconnected with Carroll County, Carrollton, and Ranburne (Alabama).
    - Bremen is interconnected with Haralson County.
    - Carroll County is interconnected with Temple, Villa Rica, Mount Zion, Cleburne County (Alabama), Bowdon, Whitesburg, Roopville, and Carrollton.
    - Carrollton is interconnected with Carroll County.
    - Columbus is interconnected with Harris County, Talbot County, and Phenix City (Alabama).
    - Haralson County is interconnected with Bremen, Tallapoosa, Cleburne County (Alabama), Polk County, Temple, and Carroll County.
    - Harris County is interconnected with Columbus, Talbot County, Hamilton, Waverly Hall, Pine Mountain Valley, and Kings Gap Homeowners Association.
    - Heard County is interconnected with Ephesus, Randolph County (Alabama), Carroll County, and Coweta County.
    - Hogansville is interconnected with Meriwether County, LaGrange, and Coweta County.
    - LaGrange is interconnected with Hogansville, West Point, and Greenville.
    - Tallapoosa is interconnected with Haralson County.
    - Temple is interconnected with Carroll County and Haralson County.
    - Villa Rica is interconnected with Carroll County and Douglasville-Douglas County.
    - West Point is interconnected with LaGrange and Lanett (Alabama).

Overall, data collected show that the QWS have a 2019 combined average treatment capacity of over 60 million gallons per day (MGD) and a 2019 combined peak operational capacity of over 92 MGD. Note, these values do not include the purchase-only systems. The 15 QWS serve a total estimated direct population of approximately 403,000 people and a total estimated consecutive population of 32,500 people. For this report, a consecutive population is defined as the population benefited from a system's regular water sales to another water system. Note that combining the direct and consecutive population values may result in certain users being counted twice. For example, Carroll County regularly sells water to Villa Rica and Columbus regularly sells water to Harris County.

2.2.2 Mapping Data

Mapping data were requested of the QWS. Specifically, information was requested related to drinking water infrastructure, such as: pumping and treatment facilities, storage tanks (ground and elevated), pipelines, booster pumps, distribution systems, hydrants, elevation values, etc. Digital mapping data (specifically GIS format) were preferred. However, hydraulic computer models and hard copy/PDF maps were also accepted. If hard copy/PDF maps were manually digitized, priority was given to digitizing water lines on the edges of the QWS distribution system because identifying potential interconnection opportunities was a main objective.

Table 2-2 shows mapping data (if any) received from the 15 QWS. Three systems provided GIS data, two systems provided CAD data, and one system provided a hydraulic computer model. Hard copy/PDF maps were obtained from nine QWS. Hard copy maps were georeferenced and digitized based on known landmarks.

2.2.3 Reports and Documents

Several reports and documents were requested from each QWS, as detailed in Section 2.1.

Table 2-3 shows the reports and other documents received from the 15 QWS. All 15 QWS had available documents, with comprehensive plans, water loss audits, permits, and sanitary surveys being the most frequently provided documents. EPD supplied recent sanitary surveys and 2015 and 2019 water audits for many systems and the Georgia Department of Community Affairs website contained comprehensive plans for many QWS. Based on review of comprehensive plans and survey responses, future (post-2019) planned water infrastructure improvements include:

- New storage tanks for Bowdon, Carroll County (x2), Carrollton, and Villa Rica
- New generators for Bowdon, Cuthbert, and Harris County
- Water line repair/replacement for Bowdon, Carrollton, Columbus, LaGrange, Temple, and Villa Rica
- Expanded distribution systems for Carroll County, Carrollton, Cuthbert, Haralson County, Heard County, and Tallapoosa
- Reservoir dredging for Haralson County
- Treatment capacity/plant expansion for Bowdon, Carroll County, Harris County, Heard County, and Villa Rica
- Addition of raw water transmission lines for Carroll County
- High service pump upgrades for Carroll County and Columbus
- A potential new interconnection for Bremen to interconnect with Carroll County
- New reservoirs for Carroll County and Haralson County
- General water infrastructure upgrades for Carroll County, Columbus, and Villa Rica

3.0 Redundant Water Supply Sources

Water supply sources were evaluated for their potential ability to provide surplus water to a neighboring water system during an emergency. Such water sources include excess capacity of current permitted allocations, new water sources, and interconnections between systems. Factors potentially affecting source availability were also noted.

3.1 Excess Capacity from Existing Water Sources

Existing water source excess capacity was evaluated for availability during short-term, defined durations, which are often less than three days but no more than 120 days. Long-term, undefined durations, as detailed further in Section 5, apply to this region but are not pursued. Therefore, existing water sources were only assessed for the 2015 and 2050 short-term, defined duration scenarios.

Table 3-1 presents the 2015 and 2050 peak day design capacity, ADD, and resultant excess capacity for each QWS, as well as current permitted peak withdrawal capacity. The ADD values exclude purchased water to portray the true net regional water need. Purchase-only QWS have no reported values because their demand is accounted for in the demand allocation of their supplier(s). Appendix A describes the peak day design capacity and ADD calculations.

Excess capacity for a groundwater QWS short-term, defined emergency scenario was calculated by subtracting the ADD (water withdrawal only, not including purchased water) from the peak day design capacity. For surface water QWS, the smaller of the peak day design capacity value and the peak permitted withdrawal value (24-hr maximum) was used for the excess capacity calculation. The excess capacity evaluation has a few key assumptions. It relies on readily available interconnections with the appropriate capacities. It also assumes that a QWS can increase to above-average production to supply water to another QWS experiencing an emergency. This assumption may not be appropriate if local needs of the supplying QWS are above average during the same emergency, resulting in less available excess capacity. In addition, because QWS data for this water planning region were collected in 2020, the self-reported 2015 peak day design capacity may reflect capital improvements that a QWS implemented between 2015 and the time the QWS was surveyed for this current analysis.

As Table 3-1 shows, there is sufficient excess capacity from existing sources for short-term, defined emergency durations for 2015 for the 12 non-purchase-only QWS. As noted above, purchase-only QWS are reported in Table 3-1 and Table A-4 as "not applicable." For 2015 demands, excess capacity is at least two times a given QWS's 2015 ADD for four of the 12 QWS: Bremen, Columbus, Cuthbert, and LaGrange. The 2015 excess capacity values range from 0.5 MGD (Bowdon) to 69.4 MGD (Columbus).

For 2050 demands, there is sufficient capacity for nine of the 12 QWS, while Bowdon has a deficit of 0.1 MGD, Harris County has a deficit of 1.5 MGD, and Villa Rica has a deficit of 1.4 MGD. While it may be likely that these three QWS would increase peak day design capacity before the predicted ADD surpasses it, the potential lack of excess capacity highlights the need for increased capacity in 2050. Excess capacity is at least two times a given QWS's 2050 ADD for two of the 12 QWS: Cuthbert and Heard County. The 2050 excess capacity values range from -1.5 MGD (Harris County) to 49.2 MGD (Columbus). The QWS' capacities were scaled to allow for a comparison of excess capacities. Appendix A describes and shows the excess capacity index calculations and values. Excluding the 2050 negative excess capacities, Villa Rica's 2015 and Carroll County's 2050 scaled excess capacity sufficiency is the lowest relative to other Middle Chattahoochee QWS.

3.2 Potential Water Sources and Storage Options

Potential additional water supply sources include groundwater, surface water, and surface water impoundments (e.g., dammed reservoirs). The Middle Chattahoochee Water Planning Region is bisected by the Georgia fall line (Figure 1-2), which separates the Piedmont geologic region from the Coastal Plain geologic region. The Piedmont geologic region is characterized by igneous and metamorphic rocks with clayey soils, while the Coastal Plain geologic region is characterized by sedimentary rocks with sandy soils.

Water withdrawals in the Chattahoochee River Basin have received special attention over the past several decades. Municipal water supply accounted for 56% of the region's total 2015 water demand (Middle Chattahoochee Water Planning Council, 2017). Certain conservation measures have been implemented due to growing concern of water use decreasing streamflow, especially during severe droughts. The Middle Chattahoochee Water Planning Council identified three water demand management practices, WC-1, WC-2, and WC-3, that focus on conservation practices and education/outreach programs.

3.2.1 Groundwater

Groundwater sources accounted for 13% of the region's 2010 water supply, whereas surface water sources accounted for 87% of the region's 2010 water supply. The 2010 groundwater withdrawal by category is as follows: 59% agriculture, 23% domestic/self-supply, 13% municipal, 4% mining, and 1% industrial (Middle Chattahoochee Water Planning Council, 2017). Aquifer systems in the Middle Chattahoochee Region include crystalline rock aquifers in the Piedmont geologic region and the Claiborne, Clayton, Cretaceous, and Floridan aquifers in the Coastal Plain geologic region. Figure 3-1 shows relevant aquifers in the Middle Chattahoochee Region.

The RWP included a groundwater resource assessment of the Claiborne Aquifer. Aquifer sustainable yield for the purposes of the resource assessment was defined as, "the amount of water that can be withdrawn without reaching specific thresholds indicating the potential for local or regional impacts." Impacts included localized aquifer drawdown, reduced stream baseflow, and long-term aquifer drawdown. Estimated sustainable yield for each aquifer was reported as a range, which reflects several computer model simulations with different assumptions. According to the RWP, total regional 2015 and estimated 2050 withdrawals from the Claiborne Aquifer are below its estimated sustainable yield (Middle Chattahoochee Water Planning Council, 2017).

Municipal groundwater withdrawals are from the Cretaceous, Claiborne, and crystalline rock aquifers (Black & Veatch, 2017). Most of the regional groundwater demand is driven by agriculture, especially agricultural withdrawals from the Clayton, Claiborne, and Cretaceous aquifers (Black & Veatch, 2017). Municipal water demand projections increase from 2015 to 2050 by approximately 17 MGD, which is primarily driven by surface water QWS, as explained in Section 3.2.2. Therefore, it is unlikely that additional municipal supply wells, other than replacement wells, are needed in the Middle Chattahoochee Region.

3.2.2 Surface Water

The 2010 surface water withdrawal by category is as follows: 49% municipal, 38% energy, and 13% agriculture (Middle Chattahoochee Water Planning Council, 2017). The Middle Chattahoochee Region contains portions of the following major river basins: Chattahoochee River Basin in the northern, central, and southern part of the region; Flint River Basin in the far southeastern part of the region; and Tallapoosa River Basin in the far northern part of the region. Figure 3-2 shows relevant river basins in the Middle Chattahoochee Region. The Chattahoochee River is the major river within the region. West Point

Lake, Lake Harding, Lake Oliver, and Walter F. George Reservoir are major reservoirs within the region. Several major reservoirs are regulated by the U.S. Army Corps of Engineers (USACE) or the Federal Energy Regulatory Commission (FERC).

Surface water availability resource assessment models were conducted by EPD to evaluate consumptive demand and dry conditions on stream flows and lake storage. Potential gaps in terms of magnitude and duration were identified when a model fell below a threshold. Model results for 2015 and 2050 in the Flint River Basin indicated that no potential gaps exist at Carsonville or Montezuma nodes, while potential gaps exist at the Bainbridge node. For context, Bainbridge is a Lower Flint-Ochlockonee QWS located near the Bainbridge node. The Middle Chattahoochee Water Planning Council noted that potential gaps at the Bainbridge node are affected in part by groundwater within the Upper Floridan Aquifer in the Dougherty Plain because of the high groundwater-surface water connection in this area. Model results for 2015 and 2050 in the Tallapoosa River Basin indicated that potential gaps exist at Heflin and Newell nodes. For context, the Heflin and Newell nodes are in Alabama, downstream of the Tallapoosa River Basin headwaters in Haralson and Carroll Counties. Model results for 2015 and 2050 in the Chattahoochee River Basin indicated no potential gaps for the Whitesburg, Columbus, Columbia, and Woodruff Dam nodes. For context, the Whitesburg node is on the southeast border of Carroll County, the Columbus node is on the western border of Muscogee County, and the Columbia and Woodruff Dam nodes are downstream of the Middle Chattahoochee Region. The Middle Chattahoochee Water Planning Council, however, "identified significant gaps in desired lake levels and river flows and significant impacts on instream uses" (Middle Chattahoochee Water Planning Council, 2017). Specifically, the "USACE operations can affect downstream water quality... For example, instream flows in the Chattahoochee River at the Columbus and Columbia planning nodes have been identified as areas of concern by the Middle Chattahoochee Water Planning Council regarding flow availability for the assimilation of permitted wastewater discharges, including the discharge of the City of Columbus [QWS]" (Middle Chattahoochee Water Planning Council, 2017). The Council identified demand management, supply management, and instream use management practices to address potential gaps. For example, Management Practices WC-1 through WC-3, WS-1 through WS-6, and IU-1 and IU-2.

Municipal surface water withdrawals are primarily from the Chattahoochee River Basin (Black & Veatch, 2017). Most of the regional surface water demand is driven by the municipal sector, with a significant portion driven by the energy sector. As municipal water demand projections increase from 2015 to 2050 by approximately 17 MGD, increased withdrawal from existing reservoirs and/or additional municipal supply reservoirs may be needed in the Middle Chattahoochee Region.

3.2.3 New Reservoirs

Of all the potential water source and storage options, new reservoirs are the most environmentally sensitive, costly, and time-consuming (MACTEC, 2008). With Management Practice WS-1, the Middle Chattahoochee Water Planning Council noted the need to evaluate additional storage options, including addressing the potential gap at the Bainbridge node in the Flint River Basin. This could include increasing the volume of existing reservoirs or investigating new reservoir options. With Management Practice WS-2, the Council noted their intention to implement new reservoirs (e.g., Indian Creek Reservoir in the Tallapoosa River Basin) and/or increase conservation storage in existing reservoirs (e.g., dredging West Point Lake in the Chattahoochee River Basin) (Middle Chattahoochee Water Planning Council, 2017).

In 2008, Carroll County (QWS) commenced the regulatory approval process for Indian Creek Reservoir (Lower Little Tallapoosa River 25). They filed a USACE Clean Water Act Section 404 Permit Application on

December 28, 2008, and a revised Permit Application on January 19, 2018 (Carroll County Water Authority, 2021). Carroll County awaits approval, and if the permit is granted, the county will begin compensatory mitigation, reservoir design and construction, and WTP design and construction over the next several years. Given Carroll County's increased future ADD and decreased excess capacity (Table 3-1), this reservoir is an option for increased capacity.

Figure 3-3 displays the potential water storage options identified in Section 3.2.3 through Section 3.2.6.

3.2.4 Georgia Inventory and Survey of Feasible Sites for Water Supply Reservoirs

In the 2008 report *GEFA Georgia Inventory and Survey of Feasible Sites for Water Supply Reservoirs*, MACTEC Engineering and Consulting, Inc., now Wood, and other consultants inventoried and surveyed drinking water supply reservoirs in Georgia (MACTEC, 2008). The effort focused on the potential to expand existing reservoirs via increasing dam heights and supplemental pumping from nearby streams. The report focused on the 78 counties above the Georgia fall line. Haralson, Carroll, Heard, Troup, and Harris Counties are above the fall line, part of Muscogee County is above the fall line, and Chattahoochee, Stewart, Quitman, Randolph, and Clay Counties are below the fall line. Existing reservoirs were screened for expansion potential and 16 reservoirs were identified in the report for potential expansion.

One of these reservoirs, Sharpe's Creek Reservoir (Carroll County), was identified in the 2008 report as a possible candidate for expansion. The report estimated that the Sharpe's Creek Reservoir could increase from 1.63 to 2.73 billion gallons of storage by raising the pool elevation 10 feet. This reservoir is used by the Carrollton QWS as a water supply reservoir. Given Carrollton's increased future ADD and decreased excess capacity (Table 3-1), this reservoir is an option for increased capacity.

Figure 3-3 displays the potential water storage options identified in Section 3.2.3 through Section 3.2.6.

3.2.5 Georgia Soil and Water Conservation Commission Flood Control Dams

In the 2007 report *Inventory and Assessment of USDA/Soil and Water Conservation District Watershed Dams: Finding Report*, the Georgia Soil and Water Conservation Commission (GSWCC), Natural Resources Conservation Service, EPD, and consultants assessed existing watershed flood control dams that could be potentially modified to serve as water supply reservoirs (GSWCC, 2007). After 357 watershed dams were assessed, 166 were prioritized for further evaluation based on environmental impacts, infrastructure impacts, and potential water supply yield. Twenty watershed dams were initially selected for more detailed studies. Eight additional watershed dams were evaluated in areas where "demand would exceed supply in the near future" (GSWCC, 2009).

The Middle Chattahoochee Region has 46 watershed dams: 5 in Haralson County, 26 in Carroll County, 1 in Troup County, 3 in Harris County, and 11 in Muscogee County. Of the region's watershed dams, 18 were part of the 166 prioritized watershed dams: Little RVR 07; Little Tallapoosa RVR 06, 16, 19, 20, 21, 30, and 31; Lower Little Tallapoosa RVR 14, 19, 25, 35, 74, 80, 82, and 93; and Palmetto CR 01 and 10. Four watershed dams in Carroll County were identified by GSWCC as high-potential water supply reservoirs: Little Tallapoosa RVR 19 and 20, and Lower Little Tallapoosa RVR 14 and 19. The GSWCC issued individual reports for each of the 28 high-potential water supply reservoirs, and the four within the Middle Chattahoochee Region are detailed below:

- Little Tallapoosa RVR 19. Construction of a larger dam would increase the impoundment's surface area to 933 acres and the safe yield to approximately 5.6 MGD (Schnabel 2007a).

- Little Tallapoosa RVR 20. Construction of a larger dam would increase the impoundment's surface area to 93 acres and the safe yield to approximately 0.87 MGD (Schnabel 2007b).
- Lower Little Tallapoosa RVR 14. Construction of a larger dam would increase the impoundment's surface area to 520 acres and the safe yield to approximately 7.5 MGD (Schnabel 2007c).
- Lower Little Tallapoosa RVR 19. Construction of a larger dam would increase the impoundment's surface area to 548 acres and the safe yield to approximately 9.9 MGD (Schnabel 2007d).

Given the Carroll County QWS' increased future ADD and decreased excess capacities (Table 3-1), it is possible that these flood control dams could be used as water supply reservoirs. The individual reports noted that results should be used as screening information. Therefore, further studies should be performed before considering the proposed projects for water supply reservoirs (Schnabel 2007a-d).

Figure 3-3 displays the potential water storage options identified in Section 3.2.3 through Section 3.2.6.

3.2.6 Quarries

Abandoned rock quarries may serve as potential water storage reservoirs, particularly during emergency or drought scenarios. Quarry wall stability, rock permeability, and geographic proximity are important considerations for site selection. Because the Middle Chattahoochee Water Planning Region is bisected by the fall line, both the Piedmont and Coastal Plain geologic regions are present. Piedmont geologic region bedrock and soils are generally igneous or metamorphic in origin and impermeable (unless fractured). Coastal Plain geologic region bedrock and soils are generally sedimentary in origin and permeable. Therefore, hard-rock (igneous or metamorphic) and mineral quarries are present in the Piedmont geologic region, while sand and gravel quarries are present in the Coastal Plain geologic region.

A GIS investigation was performed to assess the availability of quarries as potential reservoirs. A 5-mile radius was drawn around QWS municipal boundaries. The water treatment plant (WTP) locations were used as the radius origin for County Authority QWS. Aerial imagery was visually inspected to identify quarries. In addition, publicly available online quarry inventories were checked.

In the Middle Chattahoochee Region, several potential quarries were identified. USGS GIS data from *The State Geologic Map Compilation (SGMC) Geodatabase of the Conterminous United States* was used to identify quarry bedrock (Horton et al., 2017). In Carroll County, a seemingly active Vulcan Materials Company quarry exists approximately 5.5 miles south of downtown Villa Rica and approximately 12 miles northeast of Carrollton. The quarry's bedrock is undifferentiated granite (Horton et al., 2017). Carroll County's (QWS) distribution system is in the vicinity of the quarry. In Heard County, a potentially active quarry exists along Georgia Highway-34, approximately 5.5 miles west-southwest of Franklin. The quarries' bedrock is biotite gneiss (Horton et al., 2017). Heard County (QWS) identified this quarry as a potential water storage reservoir, and the QWS distribution system is in the vicinity of the quarry. In Troup County, a seemingly active Vulcan Materials Company quarry exists approximately 4.5 miles southeast of downtown LaGrange. The quarry is mostly in quartzite bedrock, and surrounded by gneiss, mica schist, and amphibolite bedrock (Horton et al., 2017). LaGrange's distribution system is in the vicinity of the quarry. In Muscogee County, an area of seemingly active quarries exists approximately 10 miles north-northeast of downtown Columbus. The quarries' bedrock is hornblende gneiss, amphibolite, and granite gneiss (Horton et al., 2017). Columbus's distribution system is in the vicinity of the quarry. Therefore, these quarries could serve as potential future water storage reservoirs.

Consideration should be given to the technical issues important for development and operation of a quarry that could serve as a water supply reservoir, including the potential for water seepage from the reservoir through the jointed and fractured rock mass and the stability of the rock quarry slopes, environmental permitting requirements, and water quality considerations.

Figure 3-3 displays the potential water storage options identified in Section 3.2.3 through Section 3.2.6.

3.2.7 Aquifer Storage and Recovery

Aquifer Storage and Recovery (ASR) involves injecting treated water into an aquifer and later recovering the stored water for beneficial reuse, such as for drinking water supply. ASR offers a redundant water supply that can be accessed if aquifer storage is sufficient. EPD oversees the permitting and regulation of ASR projects, and to-date, EPD has not received ASR applications nor is aware of ASR projects in Georgia (EPD, 2021a). Therefore, each QWS should individually consider the feasibility of ASR. The Middle Chattahoochee Water Planning Council's Management Practice WS-6, continue to study the use of ASR to enhance water supply, encourages the evaluation of "the potential for the use of ASR to withdraw water from peak flows or from groundwater sources and for storage in aquifers for later use for water supply or streamflow augmentation," (Middle Chattahoochee Water Planning Council, 2017).

3.3 Return Flow Reuse

There are two types of potable water reuse. Indirect potable reuse uses an environmental buffer, such as a lake, river, or a groundwater aquifer, before the water is treated at a drinking water treatment plant (EPD, 2021b). The *Indirect Potable Reuse Guidance Document* dated March 2021 describes the decision framework EPD uses to evaluate potential indirect potable reuse projects. Direct potable reuse involves the treatment and distribution of water without an environmental buffer. Potable water reuse provides another option for expanding a region's water resource portfolio.

Drinking water treatment and wastewater treatment typically occur in the same or nearby locations. When implementing direct potable reuse, the proximity of both wastewater and drinking water treatment may present considerable cost saving opportunities for municipalities. Some direct potable reuse systems may require additional water quality or process performance monitoring and/or an engineered storage buffer. In addition, because direct potable reuse has not been widely implemented, there is a lack of consensus in the scientific community about its safety. Therefore, each QWS should individually consider the feasibility of direct potable reuse.

The Middle Chattahoochee RWP lists return flows as a high priority management practice. Management Practice WW-1 encourages use of point discharges for wastewater treatment effluent disposal for major facilities (greater than 1 MGD). The Middle Chattahoochee Water Planning Council's preference is for return flows via discharge rather than land application (Middle Chattahoochee Water Planning Council, 2017).

3.4 Current Interconnections Between Systems

Several QWS interconnections exist in the Middle Chattahoochee Region. Fourteen of fifteen QWS indicated at least one interconnection with another public water system. Some of these interconnections are for regular water sales or purchases, while others are for emergencies and remain normally closed. If a QWS has excess capacity, as explained in Section 3.1, the QWS may be able to supply water to another QWS experiencing an emergency.

Figure 3-4 displays the available mapping data for the water region. As Figure 3-4 shows, multiple QWS are currently interconnected with another QWS, and several QWS have the potential to interconnect, which will be further discussed in Section 6.

3.5 Factors Affecting Availability of Water Supply

The viability of redundant water supply sources relies on certain factors, such as conveyance infrastructure, geographical barriers, permitting requirements, and source water quality compatibility.

3.5.1 Conveyance Factors

The feasibility of conveying water is a major consideration when assessing the practicality of using unused water sources to supply emergency water. Conveyance of water between two QWS or from new water sources would require construction of new pumping and piping infrastructure. The associated costs are key concerns and depend heavily on the proximity of the water source(s) to the QWS to be supplied. In addition, interconnections may be limited by natural obstructions, such as topography and surface water bodies, as well as man-made obstructions, such as roads, railroads, and buildings.

The Middle Chattahoochee Region has one QWS, Cuthbert, that receives its raw water solely from groundwater. Cuthbert is not interconnected with other systems due to the geographic distance between Cuthbert and other municipalities and the relative ease of obtaining groundwater in this region below the Georgia fall line. Surface water systems are generally interconnected in the Middle Chattahoochee Region due to the cost and upkeep requirements of surface water reservoirs and WTPs.

3.5.2 Water Withdrawal Permitting Factors

Any entity who withdraws, obtains, or utilizes groundwater in excess of 0.1 MGD must obtain a water withdrawal permit from EPD. Any entity who withdraws from, diverts from, or impounds waters of the state by more than 0.1 MGD on a monthly average basis must obtain a water withdrawal permit from EPD. The withdrawal permit identifies the permit expiration date, withdrawal purpose, withdrawal source, and standard conditions and special conditions for resource use. Table 3-1 shows the current peak permitted withdrawal limit for each QWS. For groundwater withdrawal permits, a daily peak can be above the permitted limit if the annual and monthly average withdrawals are below their respective limits. A short-term emergency water need met by excess capacity is likely to keep the QWS below their permitted values. If new water withdrawal sources are requested, they will be subject to EPD's permitting process and associated requirements, which will focus on the protection of both water quality and water quantity and take into consideration downstream impacts. The permit application may require a drought contingency plan, water conservation plan, a watershed protection plan, and/or reservoir management plan, where applicable. Therefore, water withdrawal permitting should be a key consideration when proposing new or expanded water withdrawal.

3.5.3 Water Quality Factors

Three of the 15 QWS in this region utilize groundwater sources. Raw water treatment for these QWS is similar, although certain differences exist. Differences are mainly attributed to pumping from one of the multiple principal aquifer systems, which may differ in water quality compared to the other aquifers. Within an individual aquifer, localized water chemistry and heterogeneity can be further responsible for raw water quality differences and, therefore, treatment differences.

Eleven of the 15 QWS in this region utilize surface water sources. Raw water treatment for these QWS is more robust and can vary. Differences are mainly attributed to pumping from one of the multiple surface

water systems. Factors that may affect surface water source quality include land use, potential pollutant sources, nutrient loading, and storm events within the water supply basin. If a new surface water source is proposed, a source water assessment plan may be required to evaluate its suitability.

Finished water quality should be accounted for when considering QWS interconnections such that blended water does not cause mineral precipitates, unpalatable water, or corrosion of the system infrastructure components. If interconnections are designed for water to flow in one direction, reverse flows can be another source of undesirable finished water quality. Reverse flows may resuspend settled particles or dislodge pipe scale.

4.0 Emergency Planning Benchmarks

Total demand and reliability target values were calculated for current usage (2015, immediate reliability target) and future usage (2050, long-range reliability target). The total ADD was first calculated for each QWS based on the 2015 EPD-validated water audit values. In the event a QWS is not in that dataset, as identified in Table 2-3, QWS-provided values are reported. Then, tiered reliability targets were applied to each QWS's total demand to highlight where full supply of demand may not be available during some emergency scenarios. Redundant water supply may supplement existing water sources to meet demand during these scenarios.

4.1 Calculating Total Demand

Current total ADD was calculated as follows:

Total Demand = Raw Water Withdrawal
\+ Purchased Water (within county)
\+ Purchased Water (outside county)

The individual values were obtained through the data collection process identified in Section 2.1. Table 4-1 shows 2015 total demand and the values that sum to total demand, as well as 2050 total demand. Note that 2050 total demand is reported the same as 2050 ADD (Water Withdrawal Only) for QWS that do not purchase water. Section 3.1 and Appendix A describe the methodology for obtaining 2015 and 2050 ADD, which are presented in Table 3-1. The same methodology for obtaining 2050 ADD was used to obtain values for purchase-only QWS, and those calculations are described in Appendix A and shown in Table A-2 and Table A-3. Purchased water values were reported by QWS, and aggregate volumes were checked against the 2015 EPD-validated water loss audit, as available. Where available, total water used (including non-revenue water) is reported rather than billed water.

Total demand is counted for customers both internal and external (i.e., other QWS to which water is sold) to a QWS. For example, Carroll County withdrew 4.60 MGD in 2015, of which 0.65 MGD was provided to Villa Rica. This 0.65 MGD is also reported for Villa Rica, which is appropriate because both Carroll County and Villa Rica require that amount of water to meet their total demand.

4.2 Reliability Targets

The WSIRRA states that an emergency plan should "evaluate risks and, where feasible, plan for a district-wide interconnection reliability target for immediate implementation of approximately 35% of the ADD and long-range district-wide interconnection reliability planning goal of approximately 65% of the ADD" (Senate Bill 380). These general targets provided preliminary benchmarks for emergency planning in the study and the current (i.e., year 2015) and long-range (i.e., year 2050) water demands that were calculated for each QWS. Therefore, for consistency with the MNGWPD study, the following reliability targets were used:

- 100% ADD (total demand)
- 65% ADD
- 35% ADD

The 35% and 65% reliability targets correspond to estimated usage associated with essential water needs. GEFA has identified customers with essential water needs as: hospitals, nursing home/assisted living

facilities, correctional facilities, critical industries, and schools. It should be noted that demand includes both internal customers and external customers (i.e., other QWS to which water is sold).

Table 4-2 shows each reliability target applied to the 2015 and 2050 water demands. The reliability targets were not compared with actual QWS essential water needs; they were compared to the total ADD. QWS should verify what their essential water needs are as they may be less than the 35% and 65% reliability targets. If their essential water needs are greater than the 35% and 65% reliability targets, the QWS should plan to achieve higher targets for emergency scenarios.

5.0 Water Supply Risk Evaluations

Water supply risks and corresponding emergency scenarios were identified for a statewide effort. Therefore, not every risk and scenario apply to the Middle Chattahoochee Region. To carry out the screening, specific system deficiencies (in volumetric demand) of the emergency scenarios and supply goals were calculated. Whereas Section 4 presented a general overview of the overall water availability under the reliability targets, Section 5 provides more specific information about how those reliability targets are applied to each QWS under emergency situations. The intent of Section 5 is to evaluate the capability of a QWS to supply sufficient water during a given emergency. Deficiencies from emergency situations were quantified for each QWS for current and future conditions. The maximum deficit (Critical Scenario Deficit) was determined for each QWS.

5.1 Emergency Scenarios

Table 5-1 shows the statewide water supply risks and emergency scenarios. Scenarios were assigned a duration and an evaluation selection criterion. Some of the QWS in the Middle Chattahoochee Region treat groundwater at each withdrawal well. For the purposes of this study, an individual well that receives water treatment is classified as a WTP. Alternately, a groundwater QWS can be designed with two or more wells in parallel supplying raw water to one WTP, as is the case for Haralson County. Water supply Risks A, B, C, D, G, and H are short-term defined durations, meaning less than 120 days, and often less than 3 days. Risks E and F are long-term undefined durations, meaning greater than 365 days and potentially having an indefinite duration.

Risks A through D are more traditional emergencies that are often addressed in an emergency response plan. These risks apply to systems that own drinking water infrastructure assets, whether they are pumps, WTPs, or distribution systems. These criteria were met for the QWS in this region, with exceptions for purchase-only QWS. Only Risks B and C apply to Hogansville, Tallapoosa, and Temple.

Risks E and F apply to QWS that receive water directly from the Allatoona Lake/Etowah River or Lake Lanier/Chattahoochee River systems. These two risks relate to the tri-state water litigation. The following QWS meet the criteria: LaGrange draws from West Point Lake on the Chattahoochee River; West Point draws from the Chattahoochee River just downstream of West Point Lake; Harris County draws from Lake Harding on the Chattahoochee River; and Columbus draws from either Lake Oliver (North Columbus WTP) on the Chattahoochee River or the Chattahoochee River just downstream of Lake Oliver (Fort Benning WTP). The WSIRRA states the "emergency plan shall evaluate risks..." related to, among other things, the unavailability of major raw water sources (O.C.G.A. Section 12-5-202(b)-(c)). These include QWS that use Lake Lanier/Chattahoochee River or Allatoona Lake/Etowah River as a raw water source. Georgia, Alabama, and Florida have disputed the use of two shared river basins, the Apalachicola-Chattahoochee-Flint (ACF) and the Alabama-Coosa-Tallapoosa (ACT). These river systems are used to meet multiple needs, including drinking water, power generation, agriculture, navigation, and recreation.

In 2009, U.S. District Judge Paul Magnuson ruled that Lake Lanier was not properly authorized to provide water supply to metro Atlanta. The ruling was ultimately reversed in 2011 by the 11th U.S. Circuit Court of Appeals. In 2013, Florida filed an original action against Georgia in the U.S. Supreme Court, requesting equitable apportionment of waters in the ACF Basin by claiming illegal harm to Apalachicola Bay. In April 2021, the Supreme Court denied Florida's request and Florida has not challenged the finding.

In 2015, the USACE updated the Water Control Manual for the ACT Basin. The Atlanta Regional Commission, the State of Georgia, and the Cobb County-Marietta Water Authority sued USACE because the updates did not address metro Atlanta's increased water supply needs, specifically from Lake Allatoona. The court ordered the USACE to further investigate and supply a record of decision by August 2021. The USACE ultimately granted metro Atlanta's supply requests.

At the same time, Alabama has filed suits against the USACE concerning both basins' Water Control Manuals. The ACT case is pending in Washington, D.C. and Alabama's ACF appeal is pending with the 11th U.S. Circuit Court of Appeals. These issues are vital to a proper evaluation of water supply risk. Therefore, Risks E and F were not evaluated further.

Risk G applies to surface water QWS that have a raw water supply from a dammed reservoir. In the Middle Chattahoochee Region, Risk G applies to Bowdon, Bremen, Carroll County, Carrollton, Columbus, Harris County, Heard County, LaGrange, Villa Rica, and West Point.

Risk H was assessed for the most vulnerable surface water QWS during a drought scenario. Risk H is often addressed by local governments in a water conservation plan, which outlines consumer practices that are either encouraged (voluntary) or enforced. Further, EPD has drought management rules, consistent with rules and regulations of the State of Georgia Chapter 391-3-30, that require public water systems to follow drought response strategies and actions during specified levels of declared drought. It was assumed that available raw water supply for each QWS is 40% of ADD due to drought. The two screening criteria for Risk H are described below:

1. Small watersheds are defined as Hydrologic Unit Code (HUC)-10 watersheds less than 100 square miles (CH2M, Black & Veatch, 2017). The U.S. Department of Agriculture's Natural Resources Conservation Service Geospatial Data Gateway was used to obtain GIS data. Specifically, the shapefile "10 Digit Watershed Boundary Dataset in HUC8" was used to calculate square mileage for HUC-10 watersheds.
2. Strahler Stream Order is a hierarchical method of categorizing streams by size. Strahler Stream Orders range from 1 (headwaters with no tributaries) to 12 (e.g., mouth of the Amazon River). For consistency with USGS literature about Georgia rivers (Elliott et al., 2014), major rivers in this study are defined as being Strahler Stream Order 6 or greater. The National Hydrography Dataset Plus, developed and maintained by the U.S. Environmental Protection Agency and USGS, is a collection of GIS and geospatial databases. It contains Strahler Stream Order as a "value added attribute," which was used to identify major rivers for the Middle Chattahoochee Region.

To meet the Risk H criteria, a QWS would need to have 1) a dammed reservoir in small watershed; and/or 2) withdrawal is not from a major river. Both criteria were met for Bowdon, and the second criterion was met for Haralson County. Haralson County pumps water from the Tallapoosa River into a small, on-site water basin. Haralson was nonetheless assessed for Risk H. Therefore, Risk H applies to some surface water QWS in the Middle Chattahoochee Region (see Appendix B for QWS-specific explanations).

5.2 Methodology

Water supply risk evaluations were performed to understand the capability of a QWS to supply sufficient water during a given emergency. WTP capacity and QWS demand values reported correspond to the values and concepts described in Sections 3 and 4. Note that the reliability target values were determined

as described in Section 4.2. They are constants that do not depend on the emergency scenarios. The following process was performed for both 2015 and 2050 water supply risk evaluations.

Deficit was calculated as follows:

Deficit = Available Water Supply
- Reliability Target Demands

Where:

Available Water Supply = Peak Day Design Capacity
+ Maximum Possible Purchased Water Supply
+ Stored Water (Scenarios A1, B, D1, D2)
- Capacity Loss Due to Emergency

For a given QWS, each WTP peak day design capacity was identified as described in Appendix A. For surface water QWS, the smaller of the peak day design capacity value and the peak permitted withdrawal value (24-hr maximum) was used for the available water supply calculation. For this region, permit limits do not affect the available water supply calculation. The maximum possible purchased water supply (applicable to QWS with interconnections) and stored water (applicable only to Scenarios A1, B, D1, and D2) were then added. Other than water supply Risk C, each emergency scenario prescribes a situation that involves a QWS-wide capacity loss (e.g., critical asset failure). The available water supply is thus the capacity remaining after the loss was subtracted and the source, purchased, and stored water were added, as applicable.

The deficit for both 2015 and 2050 was then calculated by subtracting the reliability target demands from the available water supply. In the case of a negative deficit, meaning there is more available water supply than demand, the deficit is reported as zero.

5.3 Key Assumptions

Table 5-1 presents key assumptions specific to each scenario. The following key assumptions apply to all scenarios and the corresponding deficit calculations:

- Only one QWS-wide emergency occurs at a time (i.e., Scenarios A1 and C do not occur simultaneously).
- Only one region-wide emergency occurs at a time (i.e., both Harris County and Heard County do not experience an emergency) except for Risk H (drought).
- The 2050 available water supply accounts for additional capacity due to planned capital improvements. (Bowdon, Carroll County, Carrollton, and Heard County each provided an estimated increase in water capacity due to planned capital improvements.)
- Under an emergency scenario, QWS permit restrictions are followed.
    - For groundwater withdrawal permits, a daily peak can be above the permitted limit if the annual and monthly average withdrawals are below their respective limits. Scenario A2 (30 days) is the only applicable scenario in which monthly average emergency withdrawals may approach permit limits. All groundwater QWS in this region have backup equipment available, rendering no capacity loss for Scenario A2. Therefore, permit limits are assumed to be followed.

  - For surface water withdrawal permits, a daily peak must adhere to the 24-hour maximum withdrawal limit. If a longer emergency scenario requires a QWS to exceed their permitted withdrawal limit, QWS may do so given EPD approval. Under Water Quality Control Rule 391-3-6-.07(9)(b), systems may receive a temporary permit modification to exceed existing permitted withdrawal limits for emergencies lasting less than 180 days (Ga. Comp. R. & Regs. r. 391-3-6-.07).
- As applicable, a QWS indefinitely maintains its current infrastructure, backup power, and backup equipment.
- As applicable, a QWS indefinitely maintains its current permitted withdrawal limits and existing water sale/purchase contracts and interconnections.

5.4 Evaluation Results

Table 5-2 summarizes calculated deficits by QWS for 2015 and 2050. As noted above, Risks A, B, C, D, G, and H applied to the Middle Chattahoochee Region. Three QWS had a 2015 total demand deficit (i.e., 100% ADD): Carrollton, Columbus, and LaGrange. Carrollton's capacity loss did not cause 65% ADD or 35% ADD deficits, while Columbus's and LaGrange's capacity losses caused a 65% ADD deficit. Five QWS had a 2050 total demand deficit: Bowdon, Carroll County, Carrollton, Columbus, and LaGrange. Bowdon's, Carroll County's, and Carrollton's capacity losses caused a 65% ADD deficit, while Columbus's and LaGrange's capacity losses caused 65% ADD and 35% ADD deficits. Detailed available water supply and deficit calculations by QWS are provided in Appendix B. Figure 5-1 is a summary schematic of QWS 2050 ADD, deficits, and interconnections. This figure demonstrates QWS potential future water withdrawal and sharing.

Surface water QWS in the Middle Chattahoochee Region perform less favorably when faced with the emergency scenarios because their often single WTP design lacks inherent redundancy. Chemical treatment redundancy and unit process redundancy can be part of the WTP design, but Risks A2, B, and G are especially difficult to address for surface water QWS. LaGrange is particularly vulnerable because with only one WTP and no active incoming interconnections, Scenario B leaves LaGrange with a very small available water supply.

Cuthbert, the one groundwater-only QWS in the Middle Chattahoochee Region, performs well when faced with the emergency scenarios because its multi-well, multi-WTP design offers inherent redundancy. South of the Georgia fall line, the overall flat topography of the region also allows Cuthbert to have a systemwide distribution system positioned mainly within the city limits rather than across multiple pressure zones. This means that if one WTP fails, large portions of the system will not be without water. Another reason that Cuthbert does not have deficits is because, in general, its ADD is relatively low compared to its available water supply, which is primarily driven by peak day design capacities.

Villa Rica demonstrates the benefits of interconnections. Despite relatively low peak day design capacity (1.5 MGD) and limited unit process redundancy that led to low 2015 excess capacity (0.6 MGD) and no 2050 excess capacity (-1.4 MGD; see Table 3-1), Villa Rica has no total demand deficit because of its interconnections with Carroll County and Douglasville-Douglas County. Its capacity losses are essentially negligible compared to its maximum possible purchased water. Villa Rica would likely not even approach their maximum possible purchased water value based on their 2015 total demand (1.6 MGD) and 2050 total demand (2.9 MGD). Therefore, Carroll County and Douglasville-Douglas County would likely be able to fulfil Villa Rica's total demand, if needed.

For QWS experiencing more than one deficit, the highest deficit with the longest duration scenario and/or relative likelihood scenario, or the Critical Scenario Deficit, was selected for further evaluation. The Critical Scenario Deficit, if applicable, is highlighted in gray in Table 5-2.

6.0 Evaluation of Potential Projects

The water supply risk evaluations estimated the immediate and long-range potential emergency deficits for each QWS in the Middle Chattahoochee Region. As described in Section 5.4 and Table 5-2, five Middle Chattahoochee QWS have a 2050 deficit and the Critical Scenario Deficit was selected for further evaluation. Potential conceptual-level redundancy projects were developed for a QWS based on their reduced water supply, available information, cost of implementation, and other criteria. These projects may include, but are not limited to, internal infrastructure redundancy, new interconnections, and upgrades to existing interconnections.

6.1 Potential Projects

Emergency scenarios affecting QWS, as detailed in Appendix B, were evaluated for the feasibility of a potential project to address capacity losses. Thus, not all QWS have recommended projects. This was done to prioritize logical, implementable projects for QWS with less available water supply relative to other QWS. The starting point for identifying a potential project is deciding if it will be an interconnection project (new or upgrade to existing) or internal infrastructure redundancy project. For potential projects, the following considerations were taken, as applicable:

- Potential environmental impacts
- Withdrawal permit impacts
- Water quality impacts
- Community impacts

The above four considerations are applicable to interconnection projects. Interconnection projects can address emergency scenarios A1, A2, B, D1, D2, G, and H. Depending on the project, the above four considerations are sometimes applicable to internal infrastructure redundancy projects. Table 6-1 identifies certain internal infrastructure redundancy projects for certain emergency scenarios.

For the Middle Chattahoochee Region, three types of projects are recommended: 1) new interconnection, 2) upgrade to existing interconnection, and 3) new parallel raw water transmission main to supply internal infrastructure redundancy. Interconnection projects support the Middle Chattahoochee Water Planning Council's Management Practice WS-4: encourage interconnection of regional supply systems for reliability, specifically in times of drought or emergency conditions (Middle Chattahoochee Water Planning Council, 2017). Internal infrastructure redundancy projects highlight the potential for a future management practice: encourage public water systems to enhance their water supply redundancy and treatment/unit process redundancy.

Table 6-2 shows the potential projects and provides the emergency scenarios addressed, maximum capacity added, and impact considerations. In the case of Projects 6 and 7, the maximum capacity added to Hogansville and West Point, respectively, is 0 MGD because they can already receive water with this capacity via the one-way interconnection from LaGrange. Therefore, these projects are only listed under LaGrange.

Potential environmental impacts vary widely across project types. Recall that total regional 2015 and estimated 2050 withdrawals from the Claiborne Aquifer are below its estimated sustainable yield (Middle Chattahoochee Water Planning Council, 2017). Local gaps may occur if withdrawal rates exceed aquifer or surface water sustainable yield. Therefore, stream-aquifer impacts due to short-term municipal withdrawal

increases during emergencies are not considered to be significant environmental impacts for this region. Designations and impacts by project type are detailed below.

- For interconnection projects, impacts due to excavation (for pipelines), stream crossings, and wetlands disturbance were considered, as applicable. The relative difficulty of permitting steps is implied for the following designations. A "low" designation was applied to a potential project if known streams/wetlands are not likely affected and if offsite excavation is less than 200 feet. A "medium-low" designation was applied if known streams/wetlands are not likely affected and if offsite excavation is greater than 200 but less than 5,000 feet. A "medium-high" designation was applied if known streams/wetlands may be affected and/or if offsite excavation is greater than 200 but less than 5,000 feet. A "high" designation was applied if more than 5,000 feet of offsite excavation is needed and/or wetlands are likely affected and/or a stream crossing is likely needed. A list of threatened/endangered species was not compiled for each potential project. Prior to construction, a review of site-specific threatened/endangered species should be conducted. Cost and permitting requirements may increase if species or critical habitats are impacted.
- Existing interconnections that would be upgraded to add or update a booster pump station are assumed to be in the "low" potential environmental impact designation.
- For new raw water transmission main projects, the same potential environmental impact designations as interconnection projects were applied.

Water withdrawal permit factors are described in Section 3.5.2. The QWS' 2050 ADD was compared to current peak permitted withdrawal limits (Table 3-1) to understand their ability to supply water to another QWS experiencing an emergency. Note that peak permitted withdrawal is higher than the monthly average withdrawal and annual average withdrawal, as applicable. Using peak values is appropriate because of the short-term, defined duration scenarios considered. For some QWS that regularly sell water to other water providers, the potential projects involve upgrading one-way interconnections to become two-way interconnections. Thus, some QWS do not have withdrawal permit impacts if they regularly sell water. A "low" designation was applied to a potential project if permit withdrawal limits would not limit the maximum capacity added. A "medium-low" designation was applied if permit withdrawal limits would limit the maximum capacity added by 1-49%, and a "medium-high" designation was applied if permit withdrawal limits would limit the maximum capacity added by 50-99%. A "high" designation was applied if permit withdrawal limits would completely limit the maximum capacity added. The MNGWPD study was referenced for Coweta County (Project 6) because Hogansville regularly purchases from Coweta County. According to the MNGWPD study, Coweta County has a negative 2050 excess capacity, which implies high permit withdrawal impacts.

Water quality factors are described in Section 3.5.3. A "low" designation was applied to a potential project if water treatment (e.g., treatment chemicals, chemistry, and processes) is compatible between QWS. For example, if chlorination and fluoridation, a common treatment scheme for groundwater systems, are used at both QWS. A "medium-low" designation was applied if one water treatment type differs between QWS, and a "medium-high" designation was applied if two water treatment types differ. A "high" designation was applied if water treatment significantly differs between QWS. For example, if three or more treatment types differ or if groundwater QWS and surface water QWS exchange water. If an interconnection project progresses beyond the planning-level evaluation discussed in this report, water chemistry analyses and hydraulic flow modeling should be conducted to assess both systems' abilities to exchange water.

Community impacts include excavation, easement/right of way acquisition, and multijurisdictional agreements. For the purposes of this project, easement/right of way considerations are included in approximated offsite excavation distances. A "low" designation was applied to a potential project if it occurs entirely on QWS property. A "medium-low" designation was applied if offsite excavation is less than 200 feet and/or a multijurisdictional agreement is needed. A "medium-high" designation was applied if offsite excavation is greater than 200 but less than 5,000 feet and/or a multijurisdictional agreement is needed. A "high" designation was applied if offsite excavation is more than 5,000 feet and/or a multijurisdictional agreement is needed.

6.1.1 Interconnections

Seven interconnection projects were evaluated. QWS modifications for interconnection projects include connecting, metering, pumping, and operation and maintenance requirements of new pipelines, booster pump stations, and associated appurtenances. The maximum capacity added (in MGD) from a potential project is an important factor that depends on each specific project's details. Interconnection project pipe diameter, average system pressure, QWS future excess capacity, and maximum capacity added are detailed in Table 6-3. Additional information is provided below.

- Project 1 – Bowdon and Carroll County QWS water mains are within 1 linear mile and one interconnection option exists along Garrett Creek Road. Figure 6-1 shows large-scale available mapping data for these QWS. Both QWS' existing pipe diameters in the area of interest are 6 inches. Approximately 4,910 feet of 6-inch diameter ductile iron pipe (DIP) is estimated for this project.
- Project 2 – Carroll County and Carrollton QWS are interconnected along Mt. Zion Road. It is currently a two-way, 8-inch diameter interconnection. This is an emergency-only interconnection, and the maximum flow capacity is decreased by the elevation gradient. Water head loss due to pipe friction, pipe bends, and elevation changes becomes a more important factor when pipelines extend for longer distances. Booster pump stations are needed to overcome head losses. To upgrade the interconnection, a 50-horsepower booster pump station and associated appurtenances would be added to maximize flow through existing pipes. The upgrade would increase both QWS' purchased supply during an emergency.
- Project 3 – Carroll County and Carrollton QWS are interconnected along Shady Grove Road. It is currently a two-way, 8-inch diameter interconnection. This is an emergency-only interconnection, and the maximum flow capacity is decreased by the elevation gradient. To upgrade the interconnection, a 50-horsepower booster pump station and associated appurtenances would be added to maximize flow through existing pipes. The upgrade would increase both QWS' purchased supply during an emergency.
- Project 4 – Columbus and Harris County QWS are interconnected along McKee Road near the Muscogee County and Harris County lines. It is currently a 12-inch diameter interconnection. Columbus regularly sells water to Harris County via this interconnection. To upgrade the interconnection, the existing booster pump station and associated appurtenances would be updated to maximize and reverse flow through existing pipes. The upgrade would increase Harris County's purchased supply and allow water to flow to Columbus during an emergency.

- Project 5 – Columbus and Harris County QWS are interconnected along Highway US-27 near the Muscogee County and Harris County lines. It is currently a 12-inch diameter interconnection. Columbus regularly sells water to Harris County via this interconnection. To upgrade the interconnection, the existing booster pump station and associated appurtenances would be updated to maximize and reverse flow through existing pipes. The upgrade would increase Harris County's purchased supply and allow water to flow to Columbus during an emergency.
- Project 6 – LaGrange and Hogansville QWS are interconnected along Highway US-29 south of the Hogansville city limit. It is currently a 12-inch diameter interconnection. LaGrange regularly sells water to Hogansville via this interconnection. Hogansville is a purchase-only QWS that also regularly purchases water from Coweta County. To upgrade the interconnection, a 100-horsepower booster pump station and associated appurtenances would be added to reverse flow through existing pipes. The upgrade would allow water purchased from Coweta County to flow to LaGrange during an emergency.
- Project 7 – LaGrange and West Point QWS are interconnected along W. Point Road (Highway US-29) north of the West Point city limit. It is currently a 12-inch diameter interconnection. LaGrange regularly sells water to West Point via this interconnection. To upgrade the interconnection, the existing booster pump station and associated appurtenances would be updated to reverse flow through existing pipes. The upgrade would allow water to flow to LaGrange during an emergency.

If a QWS' future excess capacity and/or permit withdrawal limits are less than the maximum capacity added, it was assumed that the QWS would increase its future supply. Bowdon would need to increase its peak day design capacity, via WTP upgrades, to be able to supply excess capacity to Carroll County. Bowdon has an estimated 2050 excess capacity deficit of 0.1 MGD. Harris County has an estimated 2050 excess capacity deficit of 1.5 MGD. Harris County's current permitted peak withdrawal is 3.0 MGD. Harris County may need to modify their water withdrawal permit to request an increased permit withdrawal limit, particularly because their 2050 total demand (4.5 MGD) is above the permitted withdrawal limit.

The above-mentioned interconnection projects are not a comprehensive list of all possible interconnections. Per Table 2-2, mapping data were not available or not complete for all QWS. Therefore, only select interconnections are discussed where data are available.

6.1.2 Internal Infrastructure Redundancy

As shown in Table 6-2, potential Project 8 is a new raw water transmission main, parallel to the existing raw water transmission main, that will supply internal infrastructure redundancy in the event the existing main has a critical failure. This project type can address emergency Risk B. LaGrange lacks raw water transmission main redundancy, lacks incoming interconnections, and West Point Lake is its only raw water source. These circumstances, in addition to feedback from the QWS, led to this potential project being recommended. QWS modifications for new transmission main projects include connecting, metering, pumping, and operation and maintenance requirements of new pipelines and associated appurtenances. The maximum capacity added (in MGD) was estimated as the value of the capacity loss under emergency Risk B. Therefore, this capacity is more accurately described as "capacity not lost" because the capacity added does not increase LaGrange's peak day design capacity.

6.2 Planning-Level Costs

Planning-level costs were estimated for potential redundancy projects in one of two ways: RSMeans (a construction cost estimating software) or manufacturer prices. Estimated unit prices represent rough order of magnitude project prices based on assumptions summarized in the following sections. A macro-level, approximate project timeframe in months was also scoped out for each project. For interconnection and raw water transmission main projects, it was assumed that multijurisdictional agreements and procurement would take 6 months, engineering design and hydraulic modelling would take 4 months, and procurement of materials and construction would take a minimum of 2 months. If a project requires a booster pump station, an extra 4 months was added to the materials procurement and construction time. Planning-level costs and macro-level timeframes are presented in Table 6-4.

6.2.1 Interconnections

Pipeline costs were estimated per linear foot of pipe. Manufacturer prices were obtained for several standard DIP sizes between 4 and 60 inches. Prices were adjusted to include a 20% mark-up for taxes and contractor overhead and profit. RSMeans was used to estimate excavation, backfill, and installation costs. Erosion control, sediment control, site clearing, and site grading considerations were also included. Construction mark-ups, including mobilization, temporary facilities, quality control testing, administration, and oversight, were 23% and applied to the subtotal construction unit prices. Additional mark-ups, including engineering design, permitting, and overall contingency, were 31% and applied to the subtotal construction unit prices and construction mark-ups. These cost estimates do not include land acquisition costs.

An underground concrete vault was assumed for new interconnection locations such that valves can be manually opened/closed. RSMeans was used to estimate concrete vault construction, valves, water meters, and associated appurtenances. Mark-ups include installation mark-ups and overall contingency.

RSMeans was used to estimate booster pump and motor costs, while a parametric cost estimating formula was used to estimate booster pump station (structure, appurtenances, electrical system) costs. Mark-ups include construction mark-ups, engineering design, and overall contingency.

For upgrading existing interconnections, a value was estimated to encompass potential work involved based on engineering judgement. This value is consistent with the MNGWPD study, and the value will need to be adjusted based on site-specific information. The exception to this price assignment is Project 5, in which a booster pump station is expected.

In addition to water head loss, operational pressure differences between interconnections may require a booster pump station or additional appurtenances to establish a functional interconnection. Therefore, hydraulic modeling is necessary to establish interconnection feasibility before a project can advance beyond this planning-level stage.

6.2.2 Internal Infrastructure Redundancy

The only type of internal infrastructure redundancy project recommended for this region is a new raw water transmission main. Therefore, applicable pipeline costs were estimated in the same way as interconnection projects.

7.0 Recommended Projects

Once potential projects were identified and planning-level costs were estimated, potential projects were then prioritized based on performance under weighted quantitative and qualitative criteria. Using a decision-based prioritization tool, absolute and weighted scores were calculated for each potential project. The options were then ranked using defined criteria (e.g., cost, potential environmental impacts). A sensitivity analysis was undertaken to test the influence of the criteria weightings on the project rank outcome. Ranking reflects projects that will most benefit the Middle Chattahoochee Water Planning Region as a whole.

7.1 Prioritization Approach

Potential project prioritization was done to compare complex information among QWS. Quantitative and qualitative scoring criteria and weighting were selected to reflect the objectives of the redundancy study. Table 7-1 presents the scoring criteria and their weighting.

Scores were assigned either 1, 2, 3, or 4. A score of 1 implies a lower overall benefit of a potential project (e.g., relatively low maximum capacity added, high cost, and high impacts), while a score of 4 implies a higher overall benefit of a potential project (e.g., relatively high maximum capacity added, low cost, and low impacts). For interconnection projects, which have the capacity to benefit multiple water systems, select criteria were assigned the average of the two interconnecting system scores. These criteria include Criterion 4 (Added Capacity as a Percent of Total Demand), Criterion 7 (Potential System and Community Impacts), and Criterion 8 (Excess Capacity Index). For example, Project 1 (Bowdon - Carroll County interconnection) received a Criterion 4 score of 3 for Bowdon and 1 for Carroll County. The assigned score was the average of these individual scores, resulting in a score of 2. For Criterion 1 and Criterion 2, although LaGrange regularly sells water to Hogansville and West Point, it was assumed that Project 8 benefits one system (LaGrange) because of the internal nature of the project. For Criterion 3 (Critical Scenario Duration), if multiple scenarios are addressed, the highest day duration of the scenarios addressed was used to assign a score. Non-weighted values were summed and divided by the applicable number of criteria to obtain an absolute score. The larger the absolute score, the more beneficial the potential project.

Criterion weights were assigned either 1, 2, or 3, with 1 holding less decision weight and 3 holding the most decision weight. Initial weights were assigned based on professional judgement and later tested with a sensitivity analysis. Criterion scores were multiplied by criterion weights. Values were summed and divided by the applicable number of criteria to obtain a weighted score. The larger the weighted score, the more beneficial the potential project.

Table 7-2 shows each criterion metric and its corresponding assigned score for this region's potential projects, as well as their absolute and initial weighted scores. In addition, cost per 1 MGD yield and cost per individual supplied were calculated. Table 7-3 is a decision-making summary to present the decision metrics for each potential project. An initial manual rank was assigned to each potential project based on initial weighted scores. In the case of a tie, such as Project 4 and Project 5, the absolute score was considered, and in the case of a further tie, the lower cost per individual and/or lower cost per 1 MGD yield supplied broke the tie. Project 2 and Project 3 tied across each decision metric. Therefore, each of their manual ranks is 3 and there is no rank 4. Although Project 8 supplies a critical redundancy to LaGrange and its beneficiaries (Criterion 4), this project did not rank well in other criteria, making it the eighth rank order.

7.2 Sensitivity Analysis

A sensitivity analysis was conducted to test the influence of criterion weightings on the initial manual rank outcome. First, all criteria were assigned the highest weight (3). The effect of this weighting adjustment is equivalent to the absolute score because although it amplified score values, the rank outcome was the same. Second, one of the eight criteria was assigned the highest weight (3) with the remaining seven criteria assigned the lowest weight (1). The effects of these weighting variations are described in Appendix C. The sensitivity analysis results demonstrate that each criterion is generally insensitive to weighting. However, Project 1 (Bowdon-Carroll County) is somewhat sensitive to weighting. Initially assigned weights were retained nonetheless and sensitivity analysis results can qualify the weighted scores.

7.3 Recommended Projects

With weighting reasonably assigned, as demonstrated by the sensitivity analysis results, the final manual ranks equal the initial manual ranks, which appear in Table 7-3. It is recommended that decision making priority be given to potential projects with higher rank order because the order accounts for the foremost quantitative and qualitative criteria pertinent to water supply redundancy.

Regarding interconnection projects, fair and equitable project cost allocation to each beneficiary can be achieved in several ways. First, if an interconnection primarily benefits one QWS (purchaser), that QWS will likely bear the majority of costs. The provider QWS will financially benefit if water is sold to the purchaser; thus, the provider may bear some of the costs. Second, if an interconnection primarily benefits one QWS but also adds redundancy for the provider QWS, the provider QWS may bear further costs, such as assisting with immediate costs and/or operation and maintenance costs. Third, if an interconnection mutually benefits both QWS, a cost allocation strategy would be appropriate. Such strategies can be based on QWS population served, ADD, added capacity as a percent of total demand, or other creative approaches.

7.4 Conclusion

The purpose of the Water Supply Redundancy Study is to increase Georgia's water supply solvency and reliability. This study evaluated drinking water supply, demand, treatment, storage, distribution, and interconnectivity to identify redundant water supply sources capable of providing backup water supply for each QWS.

Fifteen QWS in the Middle Chattahoochee Water Planning Region were evaluated for water supply redundancy. QWS data were collected, summarized, and evaluated for current and future conditions. Redundant water supply sources were explored, and water supply risk evaluations were conducted. Potential redundancy projects were conceptualized and costed for QWS left with notably reduced water supply during an emergency scenario. Potential projects were scored via a decision-based prioritization tool using weighted quantitative and qualitative criteria and subsequently ranked. Table 7-4 presents the potential projects sorted by final rank order. This study illustrated opportunities for improved QWS water supply redundancy and resiliency when faced with potential emergencies in the Middle Chattahoochee Water Planning Region.

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TABLES

Table 2-1
Key General Information

County	Qualified Water System	Public Water System Identification Number	Estimated Population Directly Served[1]	Estimated Consecutive Population Served[2]	Raw Water Source(s)[3]	Regular Purchases 2015-2019[4]	Irregular / Emergency Purchases 2015-2019[4]	Regular Sales 2015-2019[4]	Irregular / Emergency Sales 2015-2019[4]
Carroll	Bowdon	GA0450000	5,400	0	Surface Water (2)	-	-	-	-
Haralson	Bremen	GA1430000	6,200	0	Surface Water (2)	Haralson County	-	-	-
Carroll	Carroll County	GA0450001	46,000	14,600	Surface Water (1) Groundwater Wells (3)	-	Carrollton	Villa Rica Temple Mount Zion Cleburne County (Alabama)	Bowdon Whitesburg Roopville
Carroll	Carrollton	GA0450002	26,000	0	Surface Water (3)	-	-	None	Carroll County
Muscogee	Columbus	GA2150000	200,000	6,200	Surface Water (2)	-	-	Harris County Talbot County	-
Randolph	Cuthbert	GA2430000	3,700	0	Groundwater Wells (4)	-	-	-	-
Haralson	Haralson County	GA1430007	10,600	8,100	Surface Water (1) Groundwater Wells (2)	Anniston (Alabama)[5] Cleburne County (Alabama)	-	Tallapoosa Bremen Buchanan Polk County Waco	Carroll County
Harris	Harris County	GA1450011	22,900	100	Surface Water (1)	Columbus Talbot County	-	Kings Gap Homeowners Assoc.	-
Heard	Heard County	GA1490000	7,900	400	Surface Water (2)	-	Carroll County Coweta County	Ephesus LaGrange[6] Randolph County (Alabama)	-
Troup	Hogansville	GA2850000	3,400	100	Wholesale Purchase	LaGrange Coweta County	-	Meriwether County	-
Troup	LaGrange	GA2850001	42,000	3,000	Surface Water (1)	Heard County[6]	-	Hogansville West Point Greenville	-
Haralson	Tallapoosa	GA1430002	3,500	0	Wholesale Purchase	Haralson County	-	-	-
Carroll	Temple	GA0450005	4,500	0	Wholesale Purchase	Carroll County	-	-	-

Table 2-1
Key General Information

County	Qualified Water System	Public Water System Identification Number	Estimated Population Directly Served[1]	Estimated Consecutive Population Served[2]	Raw Water Source(s)[3]	Regular Purchases 2015-2019[4]	Irregular / Emergency Purchases 2015-2019[4]	Regular Sales 2015-2019[4]	Irregular / Emergency Sales 2015-2019[4]
Carroll	Villa Rica	GA0450006	15,500	0	Surface Water (2)	Carroll County	None	None	None
Troup	West Point	GA2850002	5,400	0	Surface Water (1)	LaGrange	None	None	None

Prepared by: GJH 11/12/20

Checked by: LCT 11/20/20

Notes:

1. The population that the system directly sells water to, rounded to the nearest 100.
2. The population benefited from the system's sale to another system, rounded to the nearest 100.
3. The value in parentheses indicates the number of sources.
4. Purchases/sales are from/to other water systems.
5. The interconnection is Cleburne County's.
6. LaGrange purchases from Heard County for a few houses (in Troup County) that are connected to the Heard County system.

Table 2-2
Mapping Data Received

			Level of Mapping Data Received					
County	**Qualified Water System**	**Estimated Population Directly Served[1]**	**No Mapping Data**	**Hard Copy/PDF Maps**	**Digital Mapping Data - GIS**	**Digital Mapping Data - CAD**	**Digital Mapping Data - Google Earth**	**Hydraulic Computer Model**
Carroll	Bowdon	5,400		◊				
Haralson	Bremen	6,200	◊					
Carroll	Carroll County	46,000		◊				
Carroll	Carrollton	26,000				◊		◊
Muscogee	Columbus	200,000		◊	◊			
Randolph	Cuthbert	3,700	◊					
Haralson	Haralson County	10,600	◊					
Harris	Harris County	22,900		◊		◊		
Heard	Heard County	7,900		◊				
Troup	Hogansville	3,400		◊				
Troup	LaGrange	42,000		◊	◊			
Haralson	Tallapoosa	3,500		◊				
Carroll	Temple	4,500		◊				
Carroll	Villa Rica	15,500			◊			
Troup	West Point	5,400	◊					

Prepared by: GJH 11/12/20
Checked by: LCT 11/20/20

Notes:

1. The population that the system directly sells water to, rounded to the nearest 100.

Table 2-3
Reports and Documents Received

			Reports and Documents Received[3]								
County	**Qualified Water System**	**Estimated Population Directly Served[1]**	**Comprehensive / Capital Improvement Plan[2]**	**Permits**	**Sanitary Survey[4]**	**Water Sale / Purchase Agreements**	**Water Conservation Plan**	**Consumption / Withdrawal Reports**	**Insurance Services Office Report**	**2015 Water Loss Audit[4]**	**Emergency Response Plan**
Carroll	Bowdon	5,400	◊	◊	◊		◊			◊	◊
Haralson	Bremen	6,200	◊	◊	◊					◊	
Carroll	Carroll County	46,000	◊	◊	◊	◊		◊		◊	
Carroll	Carrollton	26,000	◊	◊	◊		◊	◊		◊	
Muscogee	Columbus	200,000	◊	◊	◊		◊			◊	◊
Randolph	Cuthbert	3,700	◊	◊	◊					◊	
Haralson	Haralson County	10,600	◊	◊	◊					◊	
Harris	Harris County	22,900	◊	◊	◊	◊	◊	◊		◊	
Heard	Heard County	7,900	◊	◊	◊			◊		◊	◊
Troup	Hogansville	3,400	◊	◊	◊	◊			◊		
Troup	LaGrange	42,000	◊	◊	◊			◊		◊	◊
Haralson	Tallapoosa	3,500	◊	◊	◊			◊		◊	
Carroll	Temple	4,500	◊		◊					◊	
Carroll	Villa Rica	15,500	◊	◊	◊	◊	◊	◊		◊	◊
Troup	West Point	5,400	◊	◊	◊					◊	

Prepared by: GJH 11/12/20

Checked by: LCT 11/20/20

Notes:

1. The population that the system directly sells water to, rounded to the nearest 100.
2. The Georgia Department of Community Affairs website contained comprehensive plans.
3. Some systems provided additional, potentially relevant documents.
4. EPD supplied recent sanitary surveys and 2015 water audits for many systems.

Table 3-1
Current and Future Excess Capacity

County	Qualified Water System (QWS)	Raw Water Source(s)[1]	2015 Peak Day Design Capacity (MGD)	2015 ADD (MGD) (Water Withdrawal Only)[2]	2015 Excess Capacity (MGD)	Current Peak Permitted Withdrawal (MGD)[3]	2050 Peak Day Design Capacity (MGD)[4]	2050 ADD (MGD) (Water Withdrawal Only)[5]	2050 Excess Capacity (MGD)
Carroll	Bowdon	Surface Water (2)	1.0	0.5	0.5	4.5	1.0	1.1	-0.1
Haralson	Bremen	Surface Water (2)	0.8	0.2	0.6	0.8	0.8	0.5	0.3
Carroll	Carroll County	Surface Water (1) Groundwater Wells (3)	8.6	4.6	4.0	13.75(6)	12.6	11.7	0.9
Carroll	Carrollton	Surface Water (3)	12.0	4.5	7.5	12.0	12.0	5.4	6.6
Muscogee	Columbus	Surface Water (2)	100.0	30.6	69.4	102.0	100.0	50.8	49.2
Randolph	Cuthbert	Groundwater Wells (4)	3.8	0.6	3.3	1.0	3.8	0.3	3.5
Haralson	Haralson County	Surface Water (1) Groundwater Wells (2)	3.7	2.0	1.7	4.57(7)	3.7	1.5	2.2
Harris	Harris County	Surface Water (1)	3.1	1.6	1.4	3.0	3.1	4.5	-1.5
Heard	Heard County	Surface Water (2)	3.0	1.1	1.9	8.0	4.0	0.8	3.2
Troup	Hogansville	Wholesale Purchase	NA	NA	NA	NA	NA	NA	NA
Troup	LaGrange	Surface Water (1)	20.0	6.4	13.6	22.0	20.0	11.7	8.3
Haralson	Tallapoosa	Wholesale Purchase	NA	NA	NA	NA	NA	NA	NA
Carroll	Temple	Wholesale Purchase	NA	NA	NA	NA	NA	NA	NA
Carroll	Villa Rica	Surface Water (2)	1.5	0.9	0.6	1.5	1.5	2.9	-1.4
Troup	West Point	Surface Water (1)	4.2	1.1	1.0	2.1	4.2	1.5	0.6
Totals			**161.7**	**54.2**	**105.3**	**175.2**	**166.7**	**92.7**	**71.8**

Prepared by: GJH 02/04/21

Checked by: LCT 02/11/21

Notes:

ADD - average daily demand

NA - not applicable because these are purchase-only QWS

MGD - million gallons per day

1. The value in parentheses indicates the number of sources.
2. 2015 EPD-validated water loss audit values are reported. In the event a QWS is not in that dataset, as identified in Table 2-3, QWS-provided values are reported.
3. Values for groundwater systems are MGD - monthly average; values for surface water systems are combined (if multiple permits) MGD - 24-hour max. Surface water permitted withdrawal values include withdrawals for immediate water treatment and for reservoir filling.
4. Carroll County indicated expanding a WTP by 4 MGD; Heard County indicated expanding a WTP by 1 MGD.
5. Municipal and publicly-supplied industrial demand by county were allocated to each QWS.
6. 13.0 MGD is for surface water; 0.75 MGD is for groundwater.
7. 3.75 MGD is for surface water; 0.82 MGD is for groundwater.

Table 4-1
Total Water Demands

County	Qualified Water System	2015 ADD (MGD) (Water Withdrawal Only)	2015 Regular Purchased Volume - Outside County (MGD)[1]	2015 Regular Purchased Volume - Inside County (MGD)[1]	2015 Total Demand (MGD)	2050 Total Demand (MGD)
Carroll	Bowdon	0.50	0.00	0.00	0.50	1.06
Haralson	Bremen	0.24	0.00	0.67	0.91	0.50
Carroll	Carroll County	4.60	0.00	0.00	4.60	11.68
Carroll	Carrollton	4.48	0.00	0.00	4.48	5.37
Muscogee	Columbus	30.57	0.00	0.00	30.57	50.81
Randolph	Cuthbert	0.57	0.00	0.00	0.57	0.30
Haralson	Haralson County	1.99	0.18	0.00	2.17	1.53
Harris	Harris County	1.64	0.66	0.00	2.30	4.48
Heard	Heard County	1.14	0.00	0.00	1.14	0.84
Troup	Hogansville	0.00	0.29	0.22	0.51	0.90
Troup	LaGrange	6.44	0.002	0.00	6.44	11.71
Haralson	Tallapoosa	0.00	0.00	0.57	0.57	0.29
Carroll	Temple	0.00	0.00	0.29	0.29	0.86
Carroll	Villa Rica	0.91	0.00	0.65	1.56	2.95
Troup	West Point	1.15	0.00	0.01	1.15	1.47
	Totals	**54.23**	**1.13**	**2.40**	**57.76**	**94.72**

Prepared by: GJH 02/05/21

Checked by: LCT 02/11/21

Notes:

ADD - average daily demand

NA - not applicable because these are purchase-only QWS

MGD - million gallons per day

1. Values were reported by QWS, and aggregate volumes were verified with the 2015 EPD-validated water loss audit, as available.

Table 4-2
Reliability Targets for Current and Future Demand

			2015 - Immediate Reliability Target			2050 - Long-Range Reliability Target		
County	**Qualified Water System**	**Public Water System Identification Number**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**
Carroll	Bowdon	GA0450000	0.5	0.3	0.2	1.1	0.7	0.4
Haralson	Bremen	GA1430000	0.9	0.6	0.3	0.5	0.3	0.2
Carroll	Carroll County	GA0450001	4.6	3.0	1.6	11.7	7.6	4.1
Carroll	Carrollton	GA0450002	4.5	2.9	1.6	5.4	3.5	1.9
Muscogee	Columbus	GA2150000	30.6	19.9	10.7	50.8	33.0	17.8
Randolph	Cuthbert	GA2430000	0.6	0.4	0.2	0.3	0.2	0.1
Haralson	Haralson County	GA1430007	2.2	1.4	0.8	1.5	1.0	0.5
Harris	Harris County	GA1450011	2.3	1.5	0.8	4.5	2.9	1.6
Heard	Heard County	GA1490000	1.1	0.7	0.4	0.8	0.5	0.3
Troup	Hogansville	GA2850000	0.5	0.3	0.2	0.9	0.6	0.3
Troup	LaGrange	GA2850001	6.4	4.2	2.3	11.7	7.6	4.1
Haralson	Tallapoosa	GA1430002	0.6	0.4	0.2	0.3	0.2	0.1
Carroll	Temple	GA0450005	0.3	0.2	0.1	0.9	0.6	0.3
Carroll	Villa Rica	GA0450006	1.6	1.0	0.5	2.9	1.9	1.0
Troup	West Point	GA2850002	1.2	0.8	0.4	1.5	1.0	0.5
Totals			**57.8**	**37.5**	**20.2**	**94.7**	**61.6**	**33.2**

Prepared by: GJH 02/05/21

Checked by: LCT 02/11/21

Notes:

ADD - average daily demand

MGD - million gallons per day

1. Total demand (withdrawal plus purchases) is defined the same as 100% annual average day demand.

Table 5-1
Water Supply Risks and Emergency Scenarios

Water Supply Risk	Emergency Scenario	Type	Duration (Days)	Evaluation Selection Criteria	Key Assumptions
A. Failure of largest water treatment plant (WTP)	A1. Power supply failure of largest WTP	Short-term Defined Duration	1	QWS that receive water from a system-owned WTP	- Treatment capacity is based on the backup generator's capacity, if available. Otherwise, 80% of peak treatment is assumed. - In the event a QWS has a portable generator, it is assumed that generator is used at the largest WTP, per this scenario - 60% of QWS treated water storage is available at the beginning of the emergency.
	A2. Critical asset failure at largest WTP (e.g., loss of clearwell, loss of chemical treatment)	Short-term Defined Duration	30		- The longer duration excludes the availability of water storage supply. - Each WTP was evaluated for unit process redundancy and the ability to operate at a higher rate. - Critical assets for groundwater QWS include chemical treatment. Backup chemical feed equipment is required for WTPs installed after 1/1/1998.
B. Short-term catastrophic failure of a water distribution system	Critical transmission main failure from largest WTP or interconnection	Short-term Defined Duration	1	QWS with a distribution system	- 60% of QWS treated water storage is available at the beginning of the emergency.
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers a boil water notice	Short-term Defined Duration	3	QWS with a distribution system	- No capacity is lost - Water is non-potable
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Short-term Defined Duration	1	QWS that pump from a raw water source	- In the case of groundwater QWS, the aquifer supplying the largest WTP is assumed to be locally contaminated. - 60% of QWS treated water storage is available at the beginning of the emergency. - 60% of QWS raw water storage and clearwell storage is available at the beginning of the emergency.
	D2. Chemical contamination of largest raw water source	Short-term Defined Duration	1		- In the case of groundwater QWS, the aquifer supplying the largest WTP is assumed to be locally contaminated. - 60% of QWS treated water storage is available at the beginning of the emergency. - 60% of QWS raw water storage and clearwell storage is available at the beginning of the emergency.
E. Full unavailability of major raw water sources due to federal or state government actions	--	Long-term Undefined Duration	>365	QWS that use Lake Lanier/Chattahoochee River or Allatoona Lake/Etowah River as a raw water source	- Not currently evaluated
F. Limited or reduced availability of major raw water sources due to federal or state government actions	--	Long-term Undefined Duration	>365	QWS that use Lake Lanier/Chattahoochee River or Allatoona Lake/Etowah River as a raw water source	- Not currently evaluated

Table 5-1
Water Supply Risks and Emergency Scenarios

Water Supply Risk	Emergency Scenario	Type	Duration (Days)	Evaluation Selection Criteria	Key Assumptions
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Short-term Defined Duration	30	QWS that have a raw water supply from a dammed reservoir (not including Lake Lanier or Lake Allatoona)	- The longer duration excludes the availability of water storage supply.
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Short-term Defined Duration	120	QWS with reservoirs in small watersheds and no direct withdrawal from a major river	- Available raw water supply for each QWS is 40% of ADD due to drought.

Prepared by: GJH 11/10/20
Checked by: LCT 12/22/20

Notes:
ADD - average daily demand
QWS - qualified water system
WTP - water treatment plant

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Carroll	Bowdon	A1	1.1	0.5	0.3	0.2	0.0	0.0	0.0	2.2	1.1	0.7	0.4	0.0	0.0	0.0
		A2	1.6	0.5	0.3	0.2	0.0	0.0	0.0	1.6	1.1	0.7	0.4	0.0	0.0	0.0
		B	1.1	0.5	0.3	0.2	0.0	0.0	0.0	1.4	1.1	0.7	0.4	0.0	0.0	0.0
		C	1.6	0.5	0.3	0.2	0.0	0.0	0.0	1.6	1.1	0.7	0.4	0.0	0.0	0.0
		D1	1.2	0.5	0.3	0.2	0.0	0.0	0.0	1.5	1.1	0.7	0.4	0.0	0.0	0.0
		D2	1.2	0.5	0.3	0.2	0.0	0.0	0.0	1.5	1.1	0.7	0.4	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	0.6	0.5	0.3	0.2	0.0	0.0	0.0	**0.6**	**1.1**	**0.7**	**0.4**	**0.4**	**0.1**	0.0
		H	0.8	0.5	0.3	0.2	0.0	0.0	0.0	1.6	1.1	0.7	0.4	0.0	0.0	0.0
Haralson	Bremen	A1	4.1	0.9	0.6	0.3	0.0	0.0	0.0	5.9	0.5	0.3	0.2	0.0	0.0	0.0
		A2	3.3	0.9	0.6	0.3	0.0	0.0	0.0	5.1	0.5	0.3	0.2	0.0	0.0	0.0
		B	1.6	0.9	0.6	0.3	0.0	0.0	0.0	3.3	0.5	0.3	0.2	0.0	0.0	0.0
		C	3.3	0.9	0.6	0.3	0.0	0.0	0.0	5.1	0.5	0.3	0.2	0.0	0.0	0.0
		D1	3.6	0.9	0.6	0.3	0.0	0.0	0.0	5.4	0.5	0.3	0.2	0.0	0.0	0.0
		D2	3.6	0.9	0.6	0.3	0.0	0.0	0.0	5.4	0.5	0.3	0.2	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	2.5	0.9	0.6	0.3	0.0	0.0	0.0	4.3	0.5	0.3	0.2	0.0	0.0	0.0
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carroll	Carroll County	A1	17.6	4.6	3.0	1.6	0.0	0.0	0.0	22.2	11.7	7.6	4.1	0.0	0.0	0.0
		A2	13.8	4.6	3.0	1.6	0.0	0.0	0.0	17.8	11.7	7.6	4.1	0.0	0.0	0.0
		B	9.6	4.6	3.0	1.6	0.0	0.0	0.0	10.2	11.7	7.6	4.1	1.5	0.0	0.0
		C	13.8	4.6	3.0	1.6	0.0	0.0	0.0	17.8	11.7	7.6	4.1	0.0	0.0	0.0
		D1	10.5	4.6	3.0	1.6	0.0	0.0	0.0	11.1	11.7	7.6	4.1	0.6	0.0	0.0
		D2	10.5	4.6	3.0	1.6	0.0	0.0	0.0	11.1	11.7	7.6	4.1	0.6	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	5.8	4.6	3.0	1.6	0.0	0.0	0.0	**5.8**	**11.7**	**7.6**	**4.1**	**5.9**	**1.8**	0.0
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Carroll	Carrollton	A1	14.4	4.5	2.9	1.6	0.0	0.0	0.0	14.7	5.4	3.5	1.9	0.0	0.0	0.0
		A2	**3.0**	**4.5**	**2.9**	**1.6**	**1.5**	0.0	0.0	**3.0**	**5.4**	**3.5**	**1.9**	**2.4**	**0.5**	0.0
		B	9.6	4.5	2.9	1.6	0.0	0.0	0.0	9.9	5.4	3.5	1.9	0.0	0.0	0.0
		C	15.0	4.5	2.9	1.6	0.0	0.0	0.0	15.0	5.4	3.5	1.9	0.0	0.0	0.0
		D1	22.5	4.5	2.9	1.6	0.0	0.0	0.0	22.8	5.4	3.5	1.9	0.0	0.0	0.0
		D2	22.5	4.5	2.9	1.6	0.0	0.0	0.0	22.8	5.4	3.5	1.9	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	15.0	4.5	2.9	1.6	0.0	0.0	0.0	15.0	5.4	3.5	1.9	0.0	0.0	0.0
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Muscogee	Columbus	A1	99.1	30.6	19.9	10.7	0.0	0.0	0.0	99.1	50.8	33.0	17.8	0.0	0.0	0.0
		A2	106.1	30.6	19.9	10.7	0.0	0.0	0.0	106.1	50.8	33.0	17.8	0.0	0.0	0.0
		B	29.1	30.6	19.9	10.7	1.5	0.0	0.0	29.1	50.8	33.0	17.8	21.7	3.9	0.0
		C	106.1	30.6	19.9	10.7	0.0	0.0	0.0	106.1	50.8	33.0	17.8	0.0	0.0	0.0
		D1	44.1	30.6	19.9	10.7	0.0	0.0	0.0	44.1	50.8	33.0	17.8	6.7	0.0	0.0
		D2	44.1	30.6	19.9	10.7	0.0	0.0	0.0	44.1	50.8	33.0	17.8	6.7	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	**16.1**	**30.6**	**19.9**	**10.7**	**14.5**	**3.8**	0.0	**16.1**	**50.8**	**33.0**	**17.8**	**34.7**	**16.9**	**1.7**
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Randolph	Cuthbert	A1	4.4	0.6	0.4	0.2	0.0	0.0	0.0	4.4	0.3	0.2	0.1	0.0	0.0	0.0
		A2	3.8	0.6	0.4	0.2	0.0	0.0	0.0	3.8	0.3	0.2	0.1	0.0	0.0	0.0
		B	3.2	0.6	0.4	0.2	0.0	0.0	0.0	3.2	0.3	0.2	0.1	0.0	0.0	0.0
		C	3.8	0.6	0.4	0.2	0.0	0.0	0.0	3.8	0.3	0.2	0.1	0.0	0.0	0.0
		D1	3.2	0.6	0.4	0.2	0.0	0.0	0.0	3.2	0.3	0.2	0.1	0.0	0.0	0.0
		D2	3.2	0.6	0.4	0.2	0.0	0.0	0.0	3.2	0.3	0.2	0.1	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Haralson	Haralson County	A1	10.7	2.2	1.4	0.8	0.0	0.0	0.0	10.7	1.5	1.0	0.5	0.0	0.0	0.0
		A2	3.5	2.2	1.4	0.8	0.0	0.0	0.0	3.5	1.5	1.0	0.5	0.0	0.0	0.0
		B	7.5	2.2	1.4	0.8	0.0	0.0	0.0	7.5	1.5	1.0	0.5	0.0	0.0	0.0
		C	6.7	2.2	1.4	0.8	0.0	0.0	0.0	6.7	1.5	1.0	0.5	0.0	0.0	0.0
		D1	11.3	2.2	1.4	0.8	0.0	0.0	0.0	11.3	1.5	1.0	0.5	0.0	0.0	0.0
		D2	11.3	2.2	1.4	0.8	0.0	0.0	0.0	11.3	1.5	1.0	0.5	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	3.9	2.2	1.4	0.8	0.0	0.0	0.0	3.6	1.5	1.0	0.5	0.0	0.0	0.0
Harris	Harris County	A1	7.4	2.3	1.5	0.8	0.0	0.0	0.0	9.7	4.5	2.9	1.6	0.0	0.0	0.0
		A2	7.8	2.3	1.5	0.8	0.0	0.0	0.0	7.8	4.5	2.9	1.6	0.0	0.0	0.0
		B	7.4	2.3	1.5	0.8	0.0	0.0	0.0	7.4	4.5	2.9	1.6	0.0	0.0	0.0
		C	7.8	2.3	1.5	0.8	0.0	0.0	0.0	7.8	4.5	2.9	1.6	0.0	0.0	0.0
		D1	7.5	2.3	1.5	0.8	0.0	0.0	0.0	7.5	4.5	2.9	1.6	0.0	0.0	0.0
		D2	7.5	2.3	1.5	0.8	0.0	0.0	0.0	7.5	4.5	2.9	1.6	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	4.8	2.3	1.5	0.8	0.0	0.0	0.0	4.8	4.5	2.9	1.6	0.0	0.0	0.0
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heard	Heard County	A1	1.8	1.1	0.7	0.4	0.0	0.0	0.0	1.8	0.8	0.5	0.3	0.0	0.0	0.0
		A2	3.9	1.1	0.7	0.4	0.0	0.0	0.0	4.9	0.8	0.5	0.3	0.0	0.0	0.0
		B	1.8	1.1	0.7	0.4	0.0	0.0	0.0	1.8	0.8	0.5	0.3	0.0	0.0	0.0
		C	3.9	1.1	0.7	0.4	0.0	0.0	0.0	4.9	0.8	0.5	0.3	0.0	0.0	0.0
		D1	5.1	1.1	0.7	0.4	0.0	0.0	0.0	6.1	0.8	0.5	0.3	0.0	0.0	0.0
		D2	5.1	1.1	0.7	0.4	0.0	0.0	0.0	6.1	0.8	0.5	0.3	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	3.9	1.1	0.7	0.4	0.0	0.0	0.0	4.9	0.8	0.5	0.3	0.0	0.0	0.0
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Troup	Hogansville	A1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		A2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		B	1.8	0.5	0.3	0.2	0.0	0.0	0.0	1.8	0.9	0.6	0.3	0.0	0.0	0.0
		C	4.0	0.5	0.3	0.2	0.0	0.0	0.0	4.0	0.9	0.6	0.3	0.0	0.0	0.0
		D1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		D2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Troup	LaGrange	A1	19.1	6.4	4.2	2.3	0.0	0.0	0.0	19.1	11.7	7.6	4.1	0.0	0.0	0.0
		A2	20.0	6.4	4.2	2.3	0.0	0.0	0.0	20.0	11.7	7.6	4.1	0.0	0.0	0.0
		B	**3.1**	**6.4**	**4.2**	**2.3**	**3.4**	**1.1**	0.0	**3.1**	**11.7**	**7.6**	**4.1**	**8.6**	**4.6**	**1.0**
		C	20.0	6.4	4.2	2.3	0.0	0.0	0.0	20.0	11.7	7.6	4.1	0.0	0.0	0.0
		D1	14.0	6.4	4.2	2.3	0.0	0.0	0.0	14.0	11.7	7.6	4.1	0.0	0.0	0.0
		D2	14.0	6.4	4.2	2.3	0.0	0.0	0.0	14.0	11.7	7.6	4.1	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	10.0	6.4	4.2	2.3	0.0	0.0	0.0	10.0	11.7	7.6	4.1	1.7	0.0	0.0
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Haralson	Tallapoosa	A1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		A2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		B	2.6	0.6	0.4	0.2	0.0	0.0	0.0	3.1	0.3	0.2	0.1	0.0	0.0	0.0
		C	2.6	0.6	0.4	0.2	0.0	0.0	0.0	3.1	0.3	0.2	0.1	0.0	0.0	0.0
		D1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		D2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Carroll	Temple	A1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		A2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		B	5.4	0.3	0.2	0.1	0.0	0.0	0.0	2.2	0.9	0.6	0.3	0.0	0.0	0.0
		C	7.1	0.3	0.2	0.1	0.0	0.0	0.0	3.8	0.9	0.6	0.3	0.0	0.0	0.0
		D1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		D2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carroll	Villa Rica	A1	9.3	1.6	1.0	0.5	0.0	0.0	0.0	8.1	2.9	1.9	1.0	0.0	0.0	0.0
		A2	6.2	1.6	1.0	0.5	0.0	0.0	0.0	5.1	2.9	1.9	1.0	0.0	0.0	0.0
		B	7.8	1.6	1.0	0.5	0.0	0.0	0.0	6.6	2.9	1.9	1.0	0.0	0.0	0.0
		C	7.7	1.6	1.0	0.5	0.0	0.0	0.0	6.6	2.9	1.9	1.0	0.0	0.0	0.0
		D1	8.5	1.6	1.0	0.5	0.0	0.0	0.0	7.3	2.9	1.9	1.0	0.0	0.0	0.0
		D2	8.5	1.6	1.0	0.5	0.0	0.0	0.0	7.3	2.9	1.9	1.0	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	6.7	1.6	1.0	0.5	0.0	0.0	0.0	5.6	2.9	1.9	1.0	0.0	0.0	0.0
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 5-2
Deficit Summary

				2015 - Immediate Reliability Target			2015 - Deficits				2050 - Long-Range Reliability Target			2050 - Deficits		
County	**Qualified Water System**	**Scenario**	**2015 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**	**2050 Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
Troup	West Point	A1	6.6	1.2	0.8	0.4	0.0	0.0	0.0	6.6	1.5	1.0	0.5	0.0	0.0	0.0
		A2	4.6	1.2	0.8	0.4	0.0	0.0	0.0	4.6	1.5	1.0	0.5	0.0	0.0	0.0
		B	4.5	1.2	0.8	0.4	0.0	0.0	0.0	4.5	1.5	1.0	0.5	0.0	0.0	0.0
		C	4.6	1.2	0.8	0.4	0.0	0.0	0.0	4.6	1.5	1.0	0.5	0.0	0.0	0.0
		D1	4.8	1.2	0.8	0.4	0.0	0.0	0.0	4.8	1.5	1.0	0.5	0.0	0.0	0.0
		D2	4.8	1.2	0.8	0.4	0.0	0.0	0.0	4.8	1.5	1.0	0.5	0.0	0.0	0.0
		E	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		G	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		H	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Prepared by: GJH 02/22/21

Checked by: LCT 03/05/21

Notes:

ADD - average daily demand

MGD - million gallons per day

NA - not applicable

QWS - qualified water system

WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

= Critical Scenario Deficit

Table 6-1
Emergency Scenarios and Potential Internal Infrastructure Redundancy Projects

Water Supply Risk	Emergency Scenario	Internal Infrastructure Redundancy Project	Relevant Considerations: Potential Environmental Impacts	Withdrawal Permit Impacts	Water Quality Impacts	Community Impacts
A. Failure of largest water treatment plant (WTP)	A1. Power supply failure of largest WTP	Backup Generator	◊	-	-	-
	A2. Critical asset failure at largest WTP (e.g., loss of clearwell, loss of chemical treatment)	Unit Process Redundancy	-	-	-	-
B. Short-term catastrophic failure of a water distribution system	Critical transmission main failure from largest WTP or interconnection	Raw water transmission main	◊	-	-	◊
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers a boil water notice	-	-	-	-	-
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	New Well New WTP New Surface Water Source	◊	◊	◊	◊
	D2. Chemical contamination of largest raw water source	New Well New WTP New Surface Water Source	◊	◊	◊	◊
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	New Well New WTP New Surface Water Source	◊	◊	◊	◊
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	-	-	-	-	-

Prepared by: GJH 02/11/21
Checked by: LCT 03/25/21

Notes:
ADD - average daily demand
WTP - water treatment plant

Table 6-2
Potential Projects and Details

							System Impacts		
County	**Qualified Water System**	**Project Number**	**Potential Project Description**	**Emergency Scenario(s) Addressed**	**Maximum Capacity Added (MGD)**	**Potential Environmental Impacts**	**Withdrawal Permit Impacts**	**Water Quality Impacts**	**Community Impacts**
Carroll	Bowdon	1	Interconnection: Bowdon-Carroll County 0.9 miles along Garrett Creek Road	A1, A2, B, D1, D2, G, H	0.63	High: stream crossing; greater than 200 but less than 5,000 ft excavation	Bowdon: low Carroll County: low	Medium-low	Medium-high: greater than 200 but less than 5,000 ft excavation; multijurisdictional agreement.
Haralson	Bremen	-	No recommended project	-	-	-	-	-	-
Carroll	Carroll County	1	Interconnection: Bowdon-Carroll County 0.9 miles along Garrett Creek Road	A1, A2, B, D1, D2, G, H	0.63	High: stream crossing; greater than 200 but less than 5,000 ft excavation	Bowdon: low Carroll County: low	Medium-low	Medium-high: greater than 200 but less than 5,000 ft excavation; multijurisdictional agreement.
		2	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Mt Zion Road	A1, A2, B, D1, D2, G	0.68	Low: less than 200 ft excavation	Carroll County: low Carrollton: low	Medium-low	Medium-low: multijurisdictional agreement.
		3	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Shady Grove Road	A1, A2, B, D1, D2, G	0.68	Low: less than 200 ft excavation	Carroll County: low Carrollton: low	Medium-low	Medium-low: multijurisdictional agreement.
Carroll	Carrollton	2	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Mt Zion Road	A1, A2, B, D1, D2, G	0.68	Low: less than 200 ft excavation	Carroll County: low Carrollton: low	Medium-low	Medium-low: multijurisdictional agreement.
		3	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Shady Grove Road	A1, A2, B, D1, D2, G	0.68	Low: less than 200 ft excavation	Carroll County: low Carrollton: low	Medium-low	Medium-low: multijurisdictional agreement.
Muscogee	Columbus	4	Upgrade existing interconnection: ability to send water from Harris County to Columbus and increase supply to Harris County; McKee Road[1]	A1, A2, B, D1, D2, G	2.54	Low: less than 200 ft excavation	Columbus: low Harris County: high	Medium-low	Medium-low: multijurisdictional agreement.
		5	Upgrade existing interconnection: ability to send water from Harris County to Columbus and increase supply to Harris County; US-27[(1)]	A1, A2, B, D1, D2, G	2.54	Low: less than 200 ft excavation	Columbus: low Harris County: high	Medium-low	Medium-low: multijurisdictional agreement.
Randolph	Cuthbert	-	No recommended project	-	-	-	-	-	-
Haralson	Haralson County	-	No recommended project	-	-	-	-	-	-
Harris	Harris County	4	Upgrade existing interconnection: ability to send water from Harris County to Columbus and increase supply to Harris County; McKee Road[1]	A1, A2, B, D1, D2, G	1.39	Low: less than 200 ft excavation	Columbus: low Harris County: high	Medium-low	Medium-low: multijurisdictional agreement.
		5	Upgrade existing interconnection: ability to send water from Harris County to Columbus and increase supply to Harris County; US-27[(1)]	A1, A2, B, D1, D2, G	2.11	Low: less than 200 ft excavation	Columbus: low Harris County: high	Medium-low	Medium-low: multijurisdictional agreement.
Heard	Heard County	-	No recommended project	-	-	-	-	-	-
Troup	Hogansville	-	No recommended project	-	-	-	-	-	-
Troup	LaGrange	6	Upgrade existing interconnection: ability to send water from Hogansville to LaGrange[2]	A1, A2, B, D1, D2, G	2.54	Low: less than 200 ft excavation	LaGrange: NA Hogansville: NA Coweta County: high	Medium-low	Medium-low: multijurisdictional agreement.
		7	Upgrade existing interconnection: ability to send water from West Point to LaGrange[3]	A1, A2, B, D1, D2, G	2.54	Low: less than 200 ft excavation	LaGrange: NA West Point: medium-high	Medium-low	Medium-low: multijurisdictional agreement.
		8	New parallel raw water transmission main: 2.3 miles	B	20.00	High: more than 5000 ft excavation	-	-	High: more than 5000 ft excavation

Table 6-2
Potential Projects and Details

							System Impacts		
County	**Qualified Water System**	**Project Number**	**Potential Project Description**	**Emergency Scenario(s) Addressed**	**Maximum Capacity Added (MGD)**	**Potential Environmental Impacts**	**Withdrawal Permit Impacts**	**Water Quality Impacts**	**Community Impacts**
Haralson	Tallapoosa	-	No recommended project	-	-	-	-	-	-
Carroll	Temple	-	No recommended project	-	-	-	-	-	-
Carroll	Villa Rica	-	No recommended project	-	-	-	-	-	-
Troup	West Point	-	No recommended project	-	-	-	-	-	-

Prepared by: GJH 05/12/21
Checked by: LCT 05/27/21

Notes:
ft - feet
MGD - million gallons per day
NA - not applicable
WTP - water treatment plant
1. This is currently a one-way interconnection into Harris County limited by the booster pump capacity. This project upgrades the booster pump station. The maximum capacity added to Columbus is therefore the maximum flow capacity.
2. This is currently a one-way interconnection into Hogansville, a purchase-only QWS. Hogansville also purchases from Coweta County. This project involves adding a booster pump station.
3. This is currently a one-way interconnection into West Point. This project involves upgrading a booster pump station.

Table 6-3
Interconnection Project Capacity Added

Project ID	Potential Project Description	Water System Involved	Pipe Diameter (inches)	Average Pressure (psi)	2050 Excess Capacity (MGD)	Maximum Flow (MGD)	Current Maximum Possible Purchased Water (MGD)[1]	Maximum Capacity Added (MGD)
1	Interconnection: Bowdon-Carroll County 1.1 miles along Garrett Creek Road	Bowdon	6	70	-0.06	0.63	-	0.63
		Carroll County	6	100	0.89	0.63	-	0.63
2	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Mt Zion Road	Carroll County	8	100	0.89	1.13	0.45	0.68
		Carrollton	8	70	6.63	1.13	0.45	0.68
3	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Mt Zion Road	Carroll County	8	100	0.89	1.13	0.45	0.68
		Carrollton	8	70	6.63	1.13	0.45	0.68
4	Upgrade existing interconnection: ability to send water from Harris County to Columbus and increase supply to Harris County; McKee Road	Columbus	12	92	49.19	2.54	-	2.54
		Harris County	12	106	-1.48	2.54	1.152	1.39
5	Upgrade existing interconnection: ability to send water from Harris County to Columbus and increase supply to Harris County; US-27	Columbus	12	92	49.19	2.54	-	2.54
		Harris County	12	80	-1.48	2.54	0.432	2.11
6	Upgrade existing interconnection: ability to send water from Hogansville to LaGrange	LaGrange	12	85	8.29	2.54	-	2.54
		Hogansville[2]	12	83	NA	2.54	2.54	0.00
7	Upgrade existing interconnection: ability to send water from West Point to LaGrange	LaGrange	12	85	8.29	2.54	-	2.54
		West Point[2]	12	78	0.63	2.54	2.54	0.00

Prepared by: GJH 05/12/21
Checked by: LCT 05/27/21

Notes:
MGD - million gallons per day
psi - pound-force per square inch
1. These values are reported by the QWS or are existing booster pump station capacities, as applicable.
1. In these projects, the new supplier's maximum capacity added is 0 MGD because they are not benefitted.

Table 6-4
Planning-Level Costs for Potential Projects

Project Number	Qualified Water System(s) Benefitted	Potential Project Description	Maximum Capacity Added (MGD)	Length of Pipes (ft)	Project Specifics	Estimated Unit Cost ($)	Additional Cost Items	Additional Cost ($)	Total Estimated Cost ($)	Macro-Level Project Timeframe
1	Bowdon Carroll County	Interconnection: Bowdon-Carroll County; 0.9 miles along Garrett Creek Road	0.63	4910	6-inch diameter DIP	$ 140	(1) control valve station	$ 36,485	$ 723,900	12 months
2	Carroll County Carrollton	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Mt Zion Road	0.68	-	8-inch diameter DIP	-	(1) 50 HP booster pump station	$ 1,071,000	$ 1,071,000	16 months
3	Carroll County Carrollton	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Shady Grove Road	0.68	-	8-inch diameter DIP	-	(1) 50 HP booster pump station	$ 1,071,000	$ 1,071,000	16 months
4	Columbus Harris County	Upgrade existing interconnection: ability to send water from Harris County to Columbus and increase supply to Harris County; McKee Road[1]	1.39	-	12-inch diameter DIP	-	-	-	$ 50,000	12 months
5	Columbus Harris County	Upgrade existing interconnection: ability to send water from Harris County to Columbus and increase supply to Harris County; US-27[(1)]	2.11	-	12-inch diameter DIP	-	-	-	$ 50,000	12 months
6	LaGrange	Upgrade existing interconnection: ability to send water from Hogansville to LaGrange[2]	2.54	-	12-inch diameter DIP	-	(1) 100 HP booster pump station	$ 1,700,000	$ 1,700,000	16 months
7	LaGrange	Upgrade existing interconnection: ability to send water from West Point to LaGrange[3]	2.54	-	12-inch diameter DIP	-	-	-	$ 50,000	12 months
8	LaGrange	New parallel raw water transmission main: 2.3 miles	20.00	12087	30-inch diameter DIP	$ 770	-	-	$ 9,306,600	12 months

Prepared by: GJH 05/12/21
Checked by: LCT 05/27/21

Notes:
DIP - ductile iron pipe
ft - feet
HP - horsepower
KW - kilowatts
MGD - million gallons per day
WTP - water treatment plant

1. This is currently a one-way interconnection into Harris County in which the capacity is decreased by booster pump capacity. This project upgrades the booster pump station. The maximum capacity added to Columbus is therefore the maximum flow capacity, but only the Harris County capacity added is shown in this table.
2. This is currently a one-way interconnection into Hogansville, a purchase-only QWS. Hogansville also purchases from Coweta County. This project involves adding a booster pump station.
3. This is currently a one-way interconnection into West Point. This project involves upgrading a booster pump station.

Table 7-1
Potential Project Scoring Criteria Matrix

		Assigned Score				
	Criterion	**1**	**2**	**3**	**4**	**Weighting**
1	Systems Benefitted	One (Internal Project)	Mutually Benefits One Non-QWS	Mutually Benefits Two or More Non-QWS	Mutually Benefits Another QWS	1
2	Population Benefitted	<25,000	25,000 - 50,000	50,000 - 100,000	>100,000	3
3	Critical Scenario Duration (days)	1	3	30	120	1
4	Added Capacity as a Percent of Total Demand (%)	0-25%	26-50%	50-76%	>76%	2
5	Cost ($)	> $2,000,000	$1,000,000 - $2,000,000	$150,000 - $1,000,000	< $150,000	3
6	Potential Environmental Impacts	High	Medium-high	Medium-low	Low	3
7	Potential System and Community Impacts	High	Medium-high	Medium-low	Low	3
8	Excess Capacity Index	Positive Excess Capacity >0.5	Positive Excess Capacity <0.5	Negative Excess Capacity	No Excess Capacity	2

Prepared by: GJH 02/04/21
Checked by: LCT 03/25/21

Notes:
QWS - qualified water system

Table 7-2
Potential Project Criteria Scores and Weight Calculations

			1: Systems Benefitted		2: Population Benefitted		3: Critical Scenario Duration	
Project Number	**Water System(s) Benefitted**	**Potential Project Description**	**Water System(s) Benefitted**	**Score: Systems Benefitted**	**Population Benefitted[1]**	**Score: Population Benefitted**	**Emergency Scenario(s) Addressed**	**Score: Critical Scenario Duration**
1	Bowdon Carroll County	Interconnection: Bowdon-Carroll County; 0.9 miles along Garrett Creek Road	Bowdon Carroll County	4	66,000	3	A1, A2, B, D1, D2, G, H	4
2	Carroll County Carrollton	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Mt Zion Road	Carroll County Carrollton	4	86,600	3	A1, A2, B, D1, D2, G	3
3	Carroll County Carrollton	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Shady Grove Road	Carroll County Carrollton	4	86,600	3	A1, A2, B, D1, D2, G	3
4	Columbus Harris County	Upgrade existing interconnection: Harris County and Columbus; McKee Road[1]	Columbus Harris County	4	229,200	4	A1, A2, B, D1, D2, G	3
5	Columbus Harris County	Upgrade existing interconnection: Harris County and Columbus; US-27[(1)]	Columbus Harris County	4	229,200	4	A1, A2, B, D1, D2, G	3
6	LaGrange	Upgrade existing interconnection: Hogansville to LaGrange	LaGrange	1	45,000	2	A1, A2, B, D1, D2, G	3
7	LaGrange	Upgrade existing interconnection: West Point to LaGrange	LaGrange	1	45,000	2	A1, A2, B, D1, D2, G	3
8	LaGrange	New parallel raw water transmission main: 2.3 miles	LaGrange	1	45,000	2	B	1

Notes:
MGD - million gallons per day
NA - not applicable
WTP - water treatment plant
1. Only the Harris County maximum capacity added is shown in this table.

Table 7-2
Potential Project Criteria Scores and Weight Calculations

			4: Added Capacity as a Percent of Total Demand					5: Cost	
Project Number	**Water System(s) Benefitted**	**Potential Project Description**	**Maximum Capacity Added (MGD)**	**2050 Total Demand (MGD)**	**Capacity as a Percent of Total Demand (%)**	**Individual Scores**	**Score: Added Capacity as a Percent of Total Demand**	**Cost ($)**	**Score: Cost**
1	Bowdon Carroll County	Interconnection: Bowdon-Carroll County; 0.9 miles along Garrett Creek Road	0.63	Bowdon: 1.1 Carroll County: 11.7	Bowdon: 60% Carroll County: 5%	Bowdon: 3 Carroll County: 1	2	$ 723,900	3
2	Carroll County Carrollton	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Mt Zion Road	0.68	Carroll County: 11.7 Carrollton: 5.4	Carroll County: 6% Carrollton: 13%	Carroll County: 1 Carrollton: 1	1	$ 1,071,000	2
3	Carroll County Carrollton	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Shady Grove Road	0.68	Carroll County: 11.7 Carrollton: 5.4	Carroll County: 6% Carrollton: 13%	Carroll County: 1 Carrollton: 1	1	$ 1,071,000	2
4	Columbus Harris County	Upgrade existing interconnection: Harris County and Columbus; McKee Road[1]	1.39	Columbus: 50.8 Harris County: 4.5	Columbus: 5% Harris County: 31%	Columbus: 1 Harris County: 2	1.5	$ 50,000	4
5	Columbus Harris County	Upgrade existing interconnection: Harris County and Columbus; US-27[(1)]	2.11	Columbus: 50.8 Harris County: 4.5	Columbus: 5% Harris County: 47%	Columbus: 1 Harris County: 2	1.5	$ 50,000	4
6	LaGrange	Upgrade existing interconnection: Hogansville to LaGrange	2.54	11.7	22%	-	1	$ 1,700,000	2
7	LaGrange	Upgrade existing interconnection: West Point to LaGrange	2.54	11.7	22%	-	1	$ 50,000	4
8	LaGrange	New parallel raw water transmission main: 2.3 miles	20.00	11.7	171%	-	4	$ 9,306,600	1

Notes:
MGD - million gallons per day
NA - not applicable
WTP - water treatment plant
1. Only the Harris County maximum capacity added is shown in this table

Table 7-2
Potential Project Criteria Scores and Weight Calculations

			6: Potential Environmental Impacts		7: Potential System and Community Impacts				
Project Number	**Water System(s) Benefitted**	**Potential Project Description**	**Potential Environmental Impacts**	**Score: Potential Environmental Impacts**	**Withdrawal Permit Impacts**	**Water Quality Impacts**	**Community Impacts**	**Individual Scores**	**Score: Community Impacts**
1	Bowdon Carroll County	Interconnection: Bowdon-Carroll County; 0.9 miles along Garrett Creek Road	High	1	Bowdon: low Carroll County: low	Medium-low	Medium-high	Withdrawal: (4+4)/2 = 4 Water Quality: 3 Community: 2	3.0
2	Carroll County Carrollton	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Mt Zion Road	Low	4	Carroll County: low Carrollton: low	Medium-low	Medium-low	Withdrawal: (4+4)/2 = 4 Water Quality: 3 Community: 3	3.3
3	Carroll County Carrollton	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Shady Grove Road	Low	4	Carroll County: low Carrollton: low	Medium-low	Medium-low	Withdrawal: (4+4)/2 = 4 Water Quality: 3 Community: 3	3.3
4	Columbus Harris County	Upgrade existing interconnection: Harris County and Columbus; McKee Road[1]	Low	4	Columbus: low Harris County: high	Medium-low	Medium-low	Withdrawal: (4+1)/2 = 2.5 Water Quality: 3 Community: 3	2.8
5	Columbus Harris County	Upgrade existing interconnection: Harris County and Columbus; US-27[(1)]	Low	4	Columbus: low Harris County: high	Medium-low	Medium-low	Withdrawal: (4+1)/2 = 2.5 Water Quality: 3 Community: 3	2.8
6	LaGrange	Upgrade existing interconnection: Hogansville to LaGrange	Low	4	LaGrange: NA Hogansville: NA Coweta County: high	Medium-low	Medium-low	Withdrawal: 1 Water Quality: 3 Community: 3	2.3
7	LaGrange	Upgrade existing interconnection: West Point to LaGrange	Low	4	LaGrange: NA West Point: medium-high	Medium-low	Medium-low	Withdrawal: 2 Water Quality: 3 Community: 3	2.7
8	LaGrange	New parallel raw water transmission main: 2.3 miles	High	1	NA	NA	High	-	1.0

Notes:
MGD - million gallons per day
NA - not applicable
WTP - water treatment plant
1. Only the Harris County maximum capacity added is shown in this table

Table 7-2
Potential Project Criteria Scores and Weight Calculations

			8: Excess Capacity Index				Weighing Calculation								
Project Number	**Water System(s) Benefitted**	**Potential Project Description**	**2050 Excess Capacity Index**	**Individual Scores**	**Score: Excess Capacity Index**	**Absolute Score**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Weighted Score**
1	Bowdon Carroll County	Interconnection: Bowdon-Carroll County; 0.9 miles along Garrett Creek Road	Bowdon: none Carroll County: (-)	Bowdon: 4 Carroll County: 3	3.5	2.94	4	9	4	4	9	3	9	7	6.13
2	Carroll County Carrollton	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Mt Zion Road	Carroll County: (-) Carrollton: (+) < 0.5	Carroll County: 3 Carrollton: 2	2.5	2.85	4	9	3	2	6	12	10	5	6.38
3	Carroll County Carrollton	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Shady Grove Road	Carroll County: (-) Carrollton: (+) < 0.5	Carroll County: 3 Carrollton: 2	2.5	2.85	4	9	3	2	6	12	10	5	6.38
4	Columbus Harris County	Upgrade existing interconnection: Harris County and Columbus; McKee Road[1]	Columbus: (-) Harris County: none	Columbus: 3 Harris County: 4	3.5	3.35	4	12	3	3	12	12	8.5	7	7.69
5	Columbus Harris County	Upgrade existing interconnection: Harris County and Columbus; US-27[(1)]	Columbus: (-) Harris County: none	Columbus: 3 Harris County: 4	3.5	3.35	4	12	3	3	12	12	8.5	7	7.69
6	LaGrange	Upgrade existing interconnection: Hogansville to LaGrange	(-)	-	3	2.29	1	6	3	2	6	12	7	6	5.38
7	LaGrange	Upgrade existing interconnection: West Point to LaGrange	(-)	-	3	2.58	1	6	3	2	12	12	8	6	6.25
8	LaGrange	New parallel raw water transmission main: 2.3 miles	(-)	-	3	1.75	1	6	1	8	3	3	3	6	3.88

Prepared by: GJH 05/12/21
Checked by: LCT 05/27/21

Notes:
MGD - million gallons per day
NA - not applicable
WTP - water treatment plant
1. Only the Harris County maximum capacity added is shown in this table

Table 7-3
Potential Project Decision-Making Summary

Project Number	Qualified Water System(s) Benefitted	Potential Project Description	Cost Per 1 MGD Yield ($/MGD)	Cost Per Individual Supplied ($/Capita)	Absolute Score	Weighted Score	Manual Rank[1]
1	Bowdon Carroll County	Interconnection: Bowdon-Carroll County; 0.9 miles along Garrett Creek Road	$ 1,140,862	$ 10.97	2.94	6.13	6
2	Carroll County Carrollton	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Mt Zion Road	$ 1,579,563	$ 12.37	2.85	6.38	3
3	Carroll County Carrollton	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Shady Grove Road	$ 1,579,563	$ 12.37	2.85	6.38	3
4	Columbus Harris County	Upgrade existing interconnection: Harris County and Columbus; McKee Road	$ 36,073	$ 0.22	3.35	7.69	2
5	Columbus Harris County	Upgrade existing interconnection: Harris County and Columbus; US-27	$ 23,741	$ 0.22	3.35	7.69	1
6	LaGrange	Upgrade existing interconnection: Hogansville to LaGrange	$ 669,798	$ 37.78	2.29	5.38	7
7	LaGrange	Upgrade existing interconnection: West Point to LaGrange	$ 19,700	$ 1.11	2.58	6.25	5
8	LaGrange	New parallel raw water transmission main: 2.3 miles	$ 465,330	$ 206.81	1.75	3.88	8

Prepared by: GJH 05/25/21
Checked by: LCT 05/27/21

Notes:
WTP - water treatment plant
1. Project 2 and Project 3 tied across each decision metric. Therefore, each of their manual ranks is 3 and there is no rank 4.

Table 7-4
Potential Projects Sorted by Final Rank Order

Project Number	Qualified Water System(s) Benefitted	Potential Project Description	Cost ($)	Final Rank[1]
5	Columbus Harris County	Upgrade existing interconnection: Harris County and Columbus; US-27	$ 50,000	1
4	Columbus Harris County	Upgrade existing interconnection: Harris County and Columbus; McKee Road	$ 50,000	2
2	Carroll County Carrollton	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Mt Zion Road	$ 1,071,000	3
3	Carroll County Carrollton	Upgrade existing interconnection: Carroll County-Carrollton; new booster pump; Shady Grove Road	$ 1,071,000	3
7	LaGrange	Upgrade existing interconnection: West Point to LaGrange	$ 50,000	5
1	Bowdon Carroll County	Interconnection: Bowdon-Carroll County; 0.9 miles along Garrett Creek Road	$ 723,900	6
6	LaGrange	Upgrade existing interconnection: Hogansville to LaGrange	$ 1,700,000	7
8	LaGrange	New parallel raw water transmission main: 2.3 miles	$ 9,306,600	8

Prepared by: GJH 05/25/21

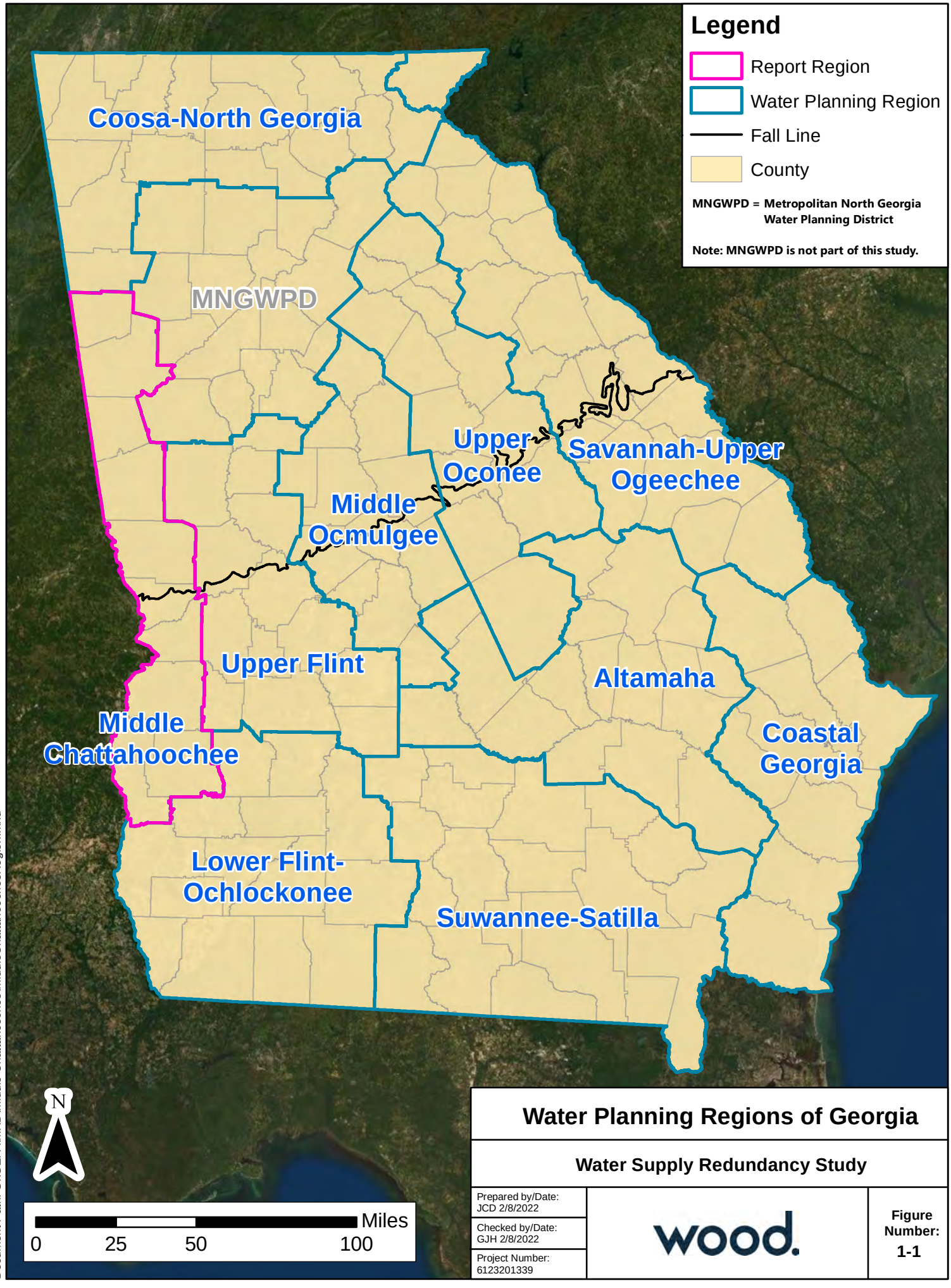
Checked by: LCT 05/27/21

Notes:

WTP - water treatment plant

1. Project 2 and Project 3 tied across each decision metric. Therefore, each of their manual ranks is 3 and there is no rank 4.

FIGURES

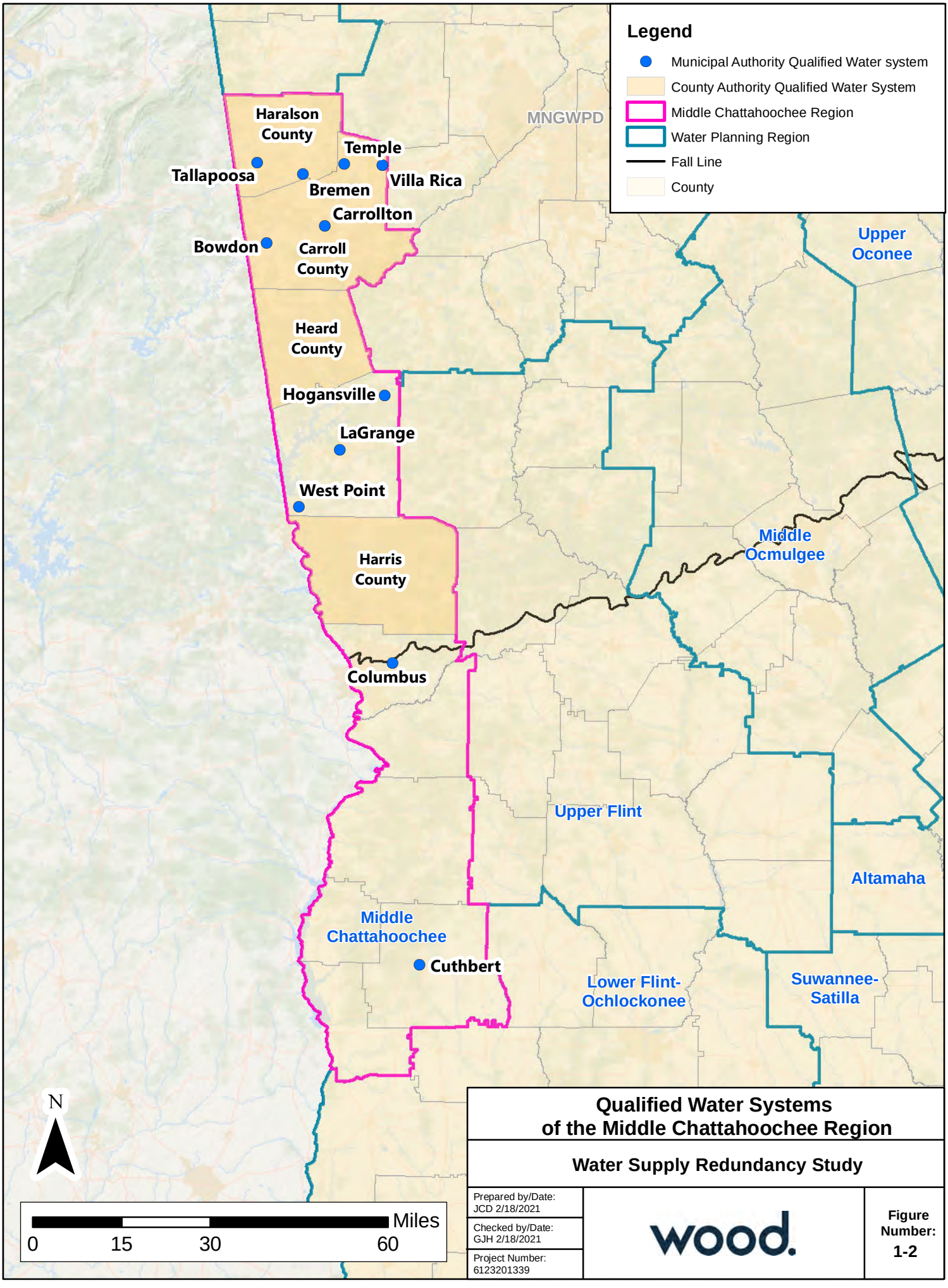


Water Planning Regions of Georgia

Water Supply Redundancy Study

Prepared by/Date: JCD 2/8/2022	wood.	Figure Number: 1-1
Checked by/Date: GJH 2/8/2022		
Project Number: 6123201339		

Document Path: G:\GEFA\MXD\Middle Chattahoochee\MiddleChattahoocheeRegion.mxd

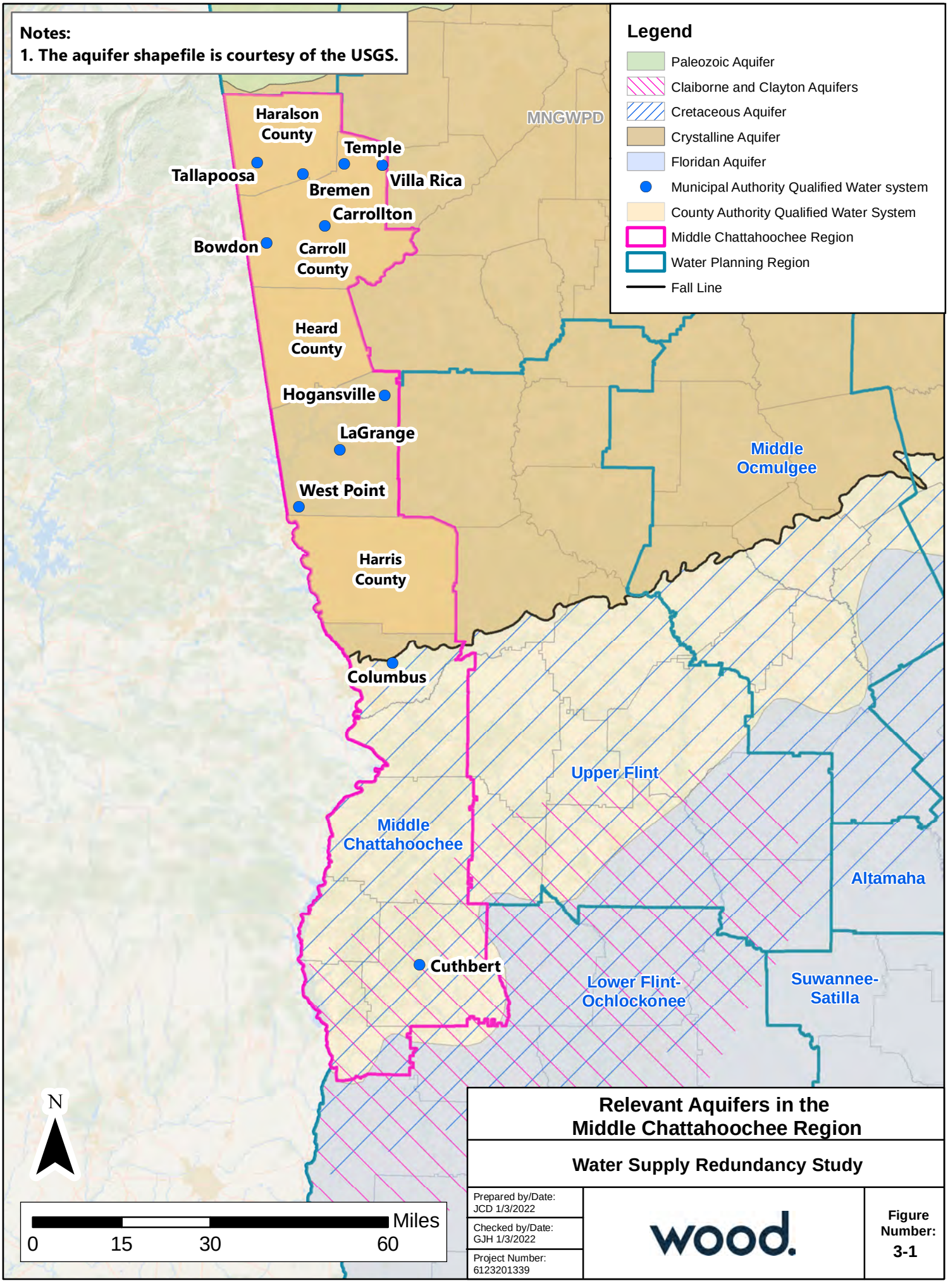


Qualified Water Systems of the Middle Chattahoochee Region

Water Supply Redundancy Study

Prepared by/Date: JCD 2/18/2021	wood.	Figure Number: 1-2
Checked by/Date: GJH 2/18/2021		
Project Number: 6123201339		

Document Path: G:\GEFA\MXD\MiddleChattahoocheeLocations.mxd



Relevant Aquifers in the Middle Chattahoochee Region

Water Supply Redundancy Study

Prepared by/Date: JCD 1/3/2022

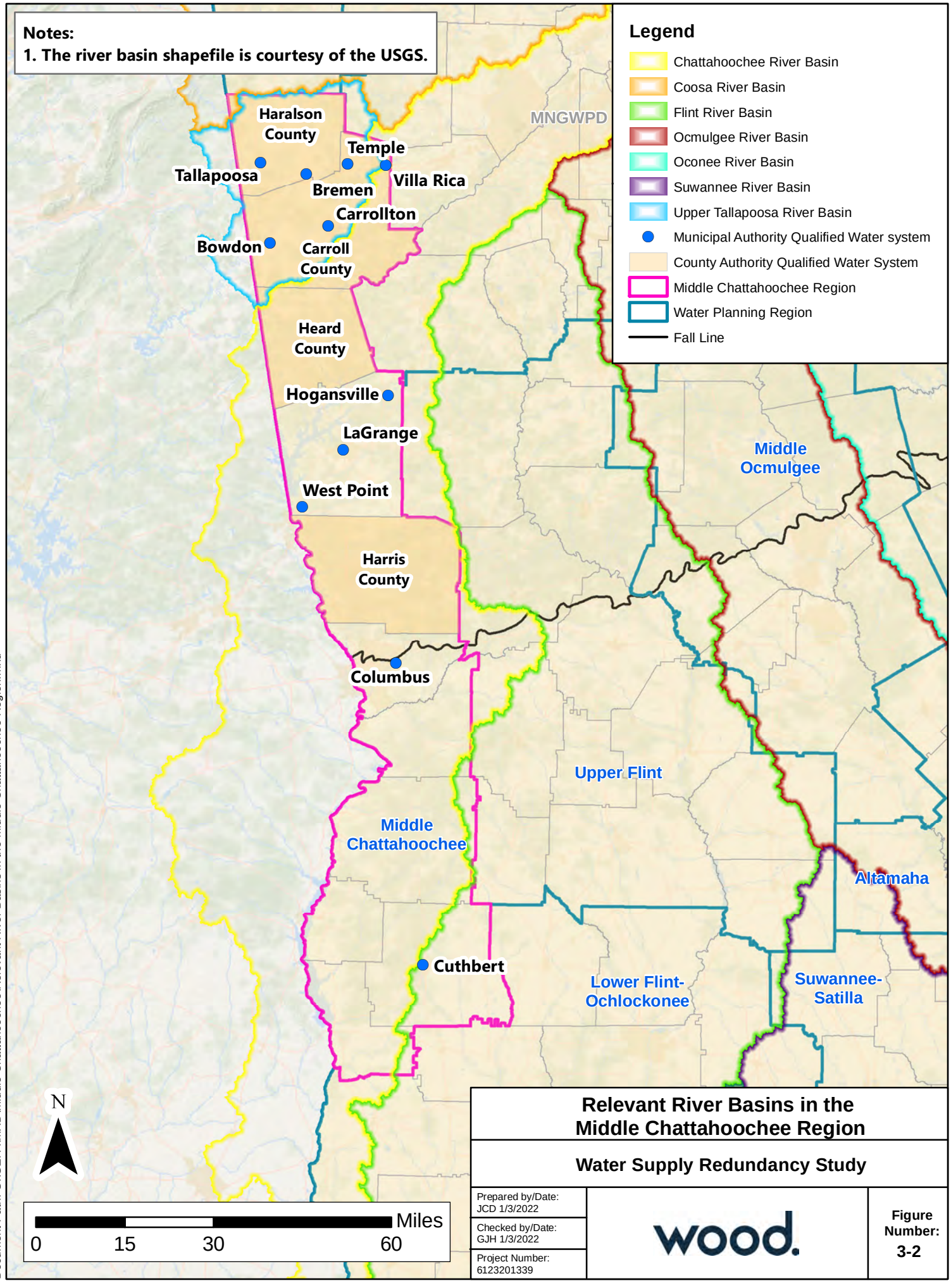
Checked by/Date: GJH 1/3/2022

Project Number: 6123201339

wood.

Figure Number: 3-1

Document Path: G:\GEFA\MXD\Middle Chattahoochee\Relevant Aquifers in the Middle Chattahoochee Region.mxd



Relevant River Basins in the Middle Chattahoochee Region

Water Supply Redundancy Study

Prepared by/Date: JCD 1/3/2022

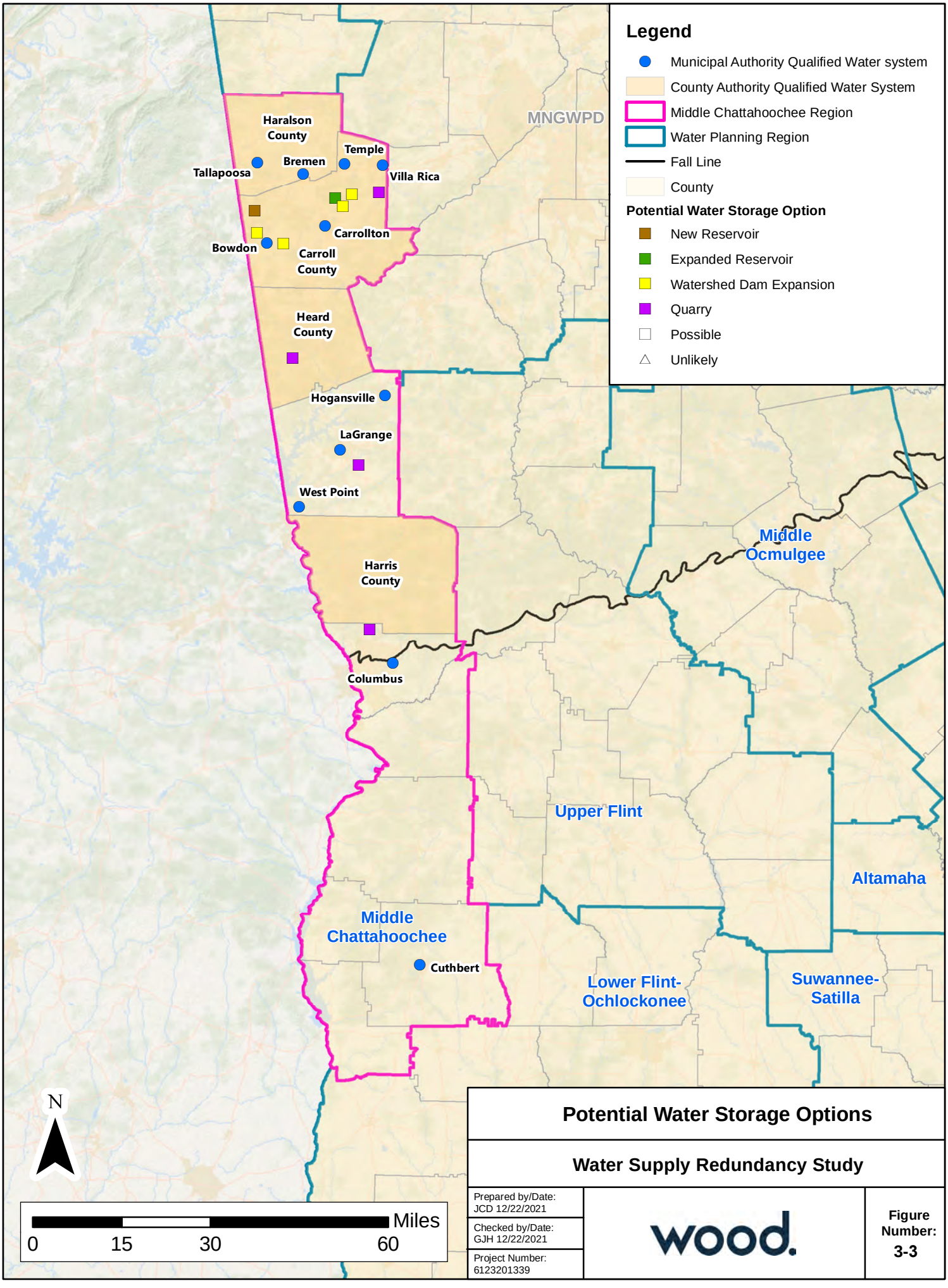
Checked by/Date: GJH 1/3/2022

Project Number: 6123201339

wood.

Figure Number: 3-2

Document Path: G:\GEFA\MXD\Middle Chattahoochee\Relevant River Basins in the Middle Chattahoochee Region.mxd



Potential Water Storage Options

Water Supply Redundancy Study

Prepared by/Date: JCD 12/22/2021	wood.	Figure Number: 3-3
Checked by/Date: GJH 12/22/2021		
Project Number: 6123201339		

Document Path: G:\GEFA\MXD\Middle_Chattahoochee_Potential_Storage_Options.mxd

Water System

- Carroll County
- Heard County
- Tallapoosa
- Temple
- Carrollton
- Villa Rica
- Water Planning Region

Tallapoosa

Villa Rica

Temple

Carroll County

Carrollton

Heard County

Notes:

1. Data are sourced as shown in Table 2-2.
2. Data are meant for planning purposes only, and do not reflect survey-grade accuracy.
3. In many cases, the entire extent of a given distribution system is not shown due to lack of data.

0 4 8 16 Miles

Avilable Mapping Data for Middle Chattahoochee Region - North

Water Supply Redundancy Study

Prepared by/Date: JCD 1/17/2022	
Checked by/Date: GJH 1/17/2022	
Project Number: 6123201339	wood.

Figure Number: 3-4a

Document Path: G:\GEFA\MXD\Middle Chattahoochee\Middle_Chattahoochee_interconnection_a.mxd

Water System

- Hogansville
- Heard County
- Carroll County
- LaGrange
- Water Planning Region

Carroll County

Heard County

Hogansville

LaGrange

Whitesburg
Ephesus
Centralhatchee
Franklin
Grantville
Woodland
Roanoke
Five Points
Lafayette
West Point
Lanett
Valley
Huguley
Pine Mountain
Chattahoochee Bend State Park
Lone
Amity Park
Wells Creek
Oseligee Creek
Bear Creek
Wedowee Creek
Wehadkee Creek
Whitewater Creek
Centralhatchee Creek
Hillabahatchee Creek
Chattahoochee River
New River
Flat Creek
Long Cane Creek
House Creek
Mountain Oak
Flat Shoal Creek
Sulphur Creek
Hamilton Rd
ALABAMA
GEORGIA
HEARD
RANDOLPH
TROUP
MERIWETHER
COWETA
553 ft

N

0 4 8 16 Miles

Notes:

1. Data are sourced as shown in Table 2-2.
2. Data are meant for planning purposes only, and do not reflect survey-grade accuracy.
3. In many cases, the entire extent of a given distribution system is not shown due to lack of data.

Avilable Mapping Data for Middle Chattahoochee Region - Central

Water Supply Redundancy Study

Prepared by/Date: JCD 1/6/2022	
Checked by/Date: GJH 1/6/2022	
Project Number: 6123201339	wood.

Figure Number: 3-4b

Document Path: G:\GEFA\MXD\Middle Chattahoochee\Middle_Chattahoochee_interconnection_b.mxd

Water System

- Columbus
- Harris County
- Water Planning Region

N

Harris County

Columbus

Notes:
1. Data are sourced as shown in Table 2-2.
2. Data are meant for planning purposes only, and do not reflect survey-grade accuracy.
3. In many cases, the entire extent of a given distribution system is not shown due to lack of data.

0 4 8 16 Miles

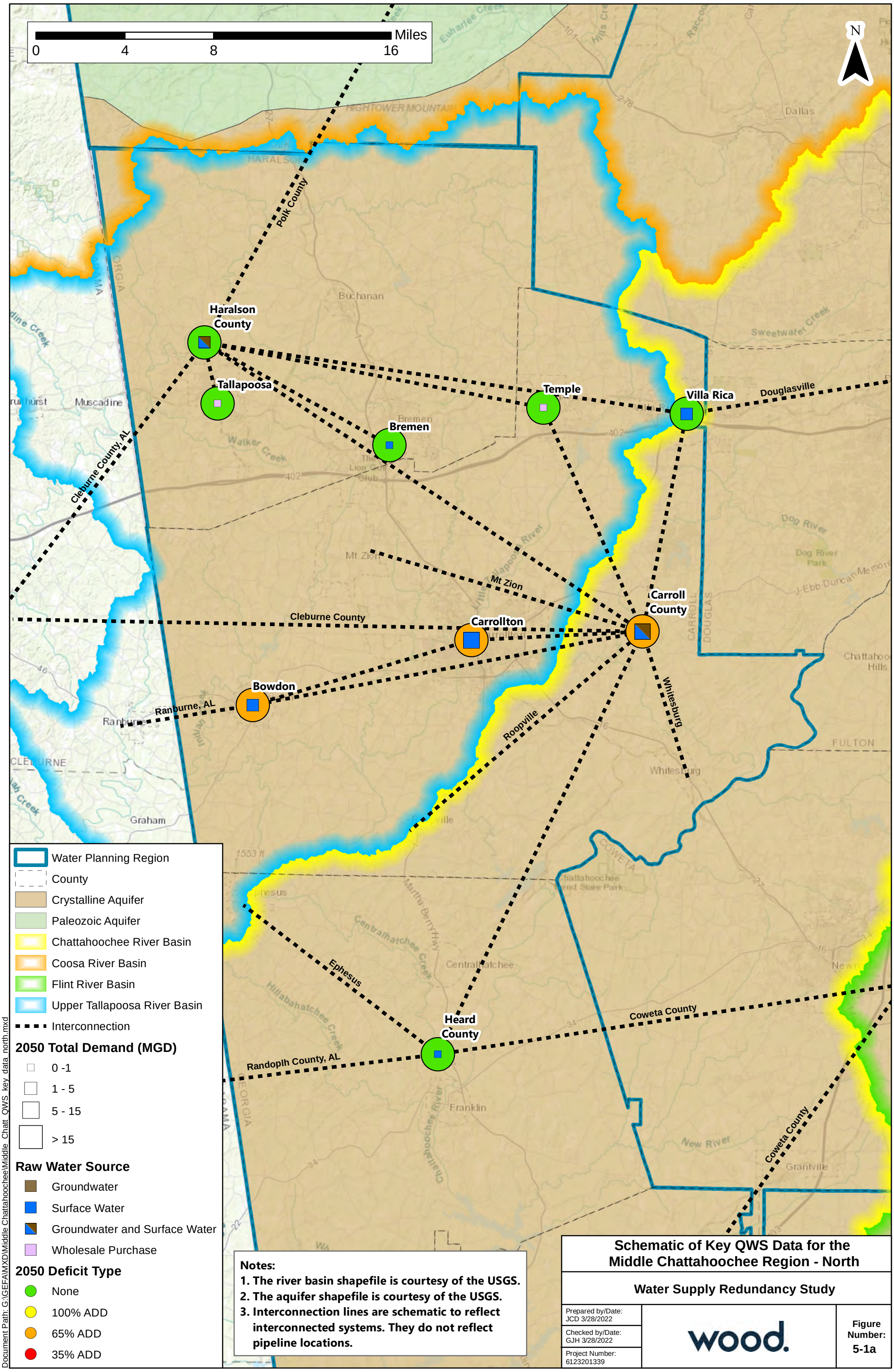
Available Mapping Data for the Middle Chattahoochee Region - South

Water Supply Redundancy Study

Prepared by/Date: JCD 5/25/2021	
Checked by/Date: GJH 5/25/2021	
Project Number: 6123201339	wood.

Figure Number: 3-4c

Document Path: G:\GEFA\MXD\Middle_Chattahoochee_interconnection_c.mxd


0
4
8
16
Miles
N
Haralson County
Polk County
Tallapoosa
Bremen
Temple
Villa Rica
Douglasville
Cleburne County, AL
Mt Zion
Carrollton
Carroll County
Cleburne County
Bowdon
Ranburne, AL
Roopville
Whitesburg
Ephesus
Heard County
Coweta County
Randoplh County, AL
Coweta County
Water Planning Region
County
Crystalline Aquifer
Paleozoic Aquifer
Chattahoochee River Basin
Coosa River Basin
Flint River Basin
Upper Tallapoosa River Basin
Interconnection
2050 Total Demand (MGD)
0 -1
1 - 5
5 - 15
> 15
Raw Water Source
Groundwater
Surface Water
Groundwater and Surface Water
Wholesale Purchase
2050 Deficit Type
None
100% ADD
65% ADD
35% ADD
Notes:
1. The river basin shapefile is courtesy of the USGS.
2. The aquifer shapefile is courtesy of the USGS.
3. Interconnection lines are schematic to reflect interconnected systems. They do not reflect pipeline locations.
Schematic of Key QWS Data for the Middle Chattahoochee Region - North
Water Supply Redundancy Study
Prepared by/Date: JCD 3/28/2022
Checked by/Date: GJH 3/28/2022
Project Number: 6123201339
wood.
Figure Number: 5-1a
Document Path: G:\GEFA\MXD\Middle ChattahoocheeMiddle Chatt QWS key data north.mxd

Miles
0 5 10 20

N

Hogansville
Coweta County
Meriwether County
LaGrange
Greeneville
West Point
Lanett, AL
Pine Mountain
Hamilton
Talbot County
Waverly Hall
Harris County
Talbot County
Columbus
Phenix City, AL
Cuthbert

Water Planning Region
County
Interconnection
Fall Line
Claiborne and Clayton Aquifers
Cretaceous Aquifer
Crystalline Aquifer
Floridan Aquifer
Chattahoochee River Basin
Flint River Basin
Ocmulgee River Basin

2050 Total Demand (MGD)

0 -1
1 - 5
5 - 15
> 15

Raw Water Source

Groundwater
Surface Water
Groundwater and Surface Water
Wholesale Purchase

2050 Deficit Type

None
100% ADD
65% ADD
35% ADD

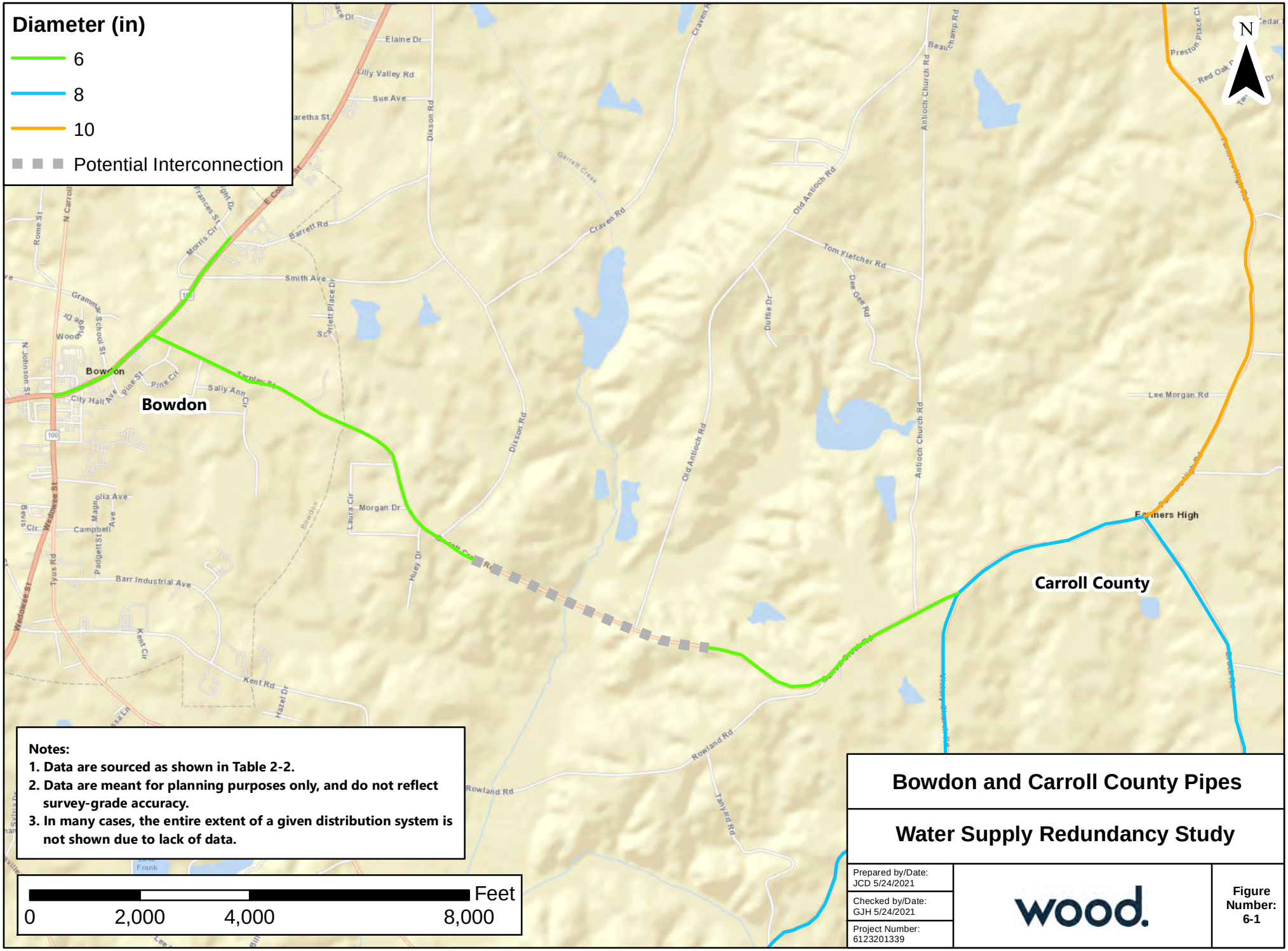
Notes:
1. The river basin shapefile is courtesy of the USGS.
2. The aquifer shapefile is courtesy of the USGS.
3. Interconnection lines are schematic to reflect interconnected systems. They do not reflect pipeline locations.

Schematic of Key QWS Data for the Middle Chattahoochee Region - South

Water Supply Redundancy Study

Prepared by/Date: JCD 3/17/2022	wood.	Figure Number: 5-1b
Checked by/Date: GJH 3/17/2022		
Project Number: 6123201339		

Document Path: G:\GEFA\MXD\Middle Chattahoochee\Middle_Chatt_QWS_key_data_south.mxd


Diameter (in)
6
8
10
Potential Interconnection
N
Bowdon
Carroll County
Elaine Dr
Lilly Valley Rd
Sue Ave
Dixson Rd
Barrett Rd
Craven Rd
Smith Ave
Old Antioch Rd
Antioch Church Rd
Tom Fletcher Rd
Dee Gee Rd
Duffie Dr
Lee Morgan Rd
Morgan Dr
Laura Cir
Huey Dr
Sally Ann Cir
Pine St
Pine Cir
City Hall Ave
Campbell
Padgett St
Barr Industrial Ave
Kent Cir
Kent Rd
Hazel Dr
Rowland Rd
Tanyard Rd
Wedowee St
Tyus Rd
Rome St
Morris Cir
Frances St
Preston Place Ct
Red Oak Dr
Notes:
1. Data are sourced as shown in Table 2-2.
2. Data are meant for planning purposes only, and do not reflect survey-grade accuracy.
3. In many cases, the entire extent of a given distribution system is not shown due to lack of data.
0
2,000
4,000
8,000
Feet
Bowdon and Carroll County Pipes
Water Supply Redundancy Study
Prepared by/Date: JCD 5/24/2021
Checked by/Date: GJH 5/24/2021
Project Number: 6123201339
wood.
Figure Number: 6-1
Document Path: G:\GEFA\MXD\Bowden_Carroll_Co_Pipes.mxd

Appendix A: Excess Capacity Calculations

Contents

List of Tables

Acronyms

ADD	Average Daily Demand
EPD	Environmental Protection Division
GEFA	Georgia Environmental Finance Authority
GPM	Gallons Per Minute
MGD	Million Gallon(s) Per Day
QWS	Qualified Water System(s)
RWP	Regional Water Plan
USGS	U.S. Geological Survey
WTP	Water Treatment Plant

1.0 Introduction

This appendix describes and shows the peak day design capacity, average daily demand (ADD), and excess capacity index calculations.

2.0 Calculations

2.1 Peak Day Design Capacity

Peak day design capacity, defined as the maximum amount of water that can be pumped and treated within 24 hours, depends mostly on the water treatment plant (WTP) configuration. For a groundwater-based qualified water system(s) (QWS), if water is treated at each well, then the peak day design value was calculated as the sum of each pump peak capacity (in gallons per minute [GPM] converted to million gallon(s) per day [MGD]). If water is treated at a single WTP after being pumped from multiple wells, then the peak day design value was calculated as the sum of each WTP's peak treatment capacity.

The 2050 peak day design capacity reflects current 2015 QWS peak day design capacity plus any capacity-expanding capital improvements identified by the QWS. For this water planning region, Carroll County indicated expanding a WTP by 4 MGD; and Heard County indicated expanding a WTP by 1 MGD.

2.2 Average Daily Demand

The 2015 ADD (water withdrawal only, not including purchased water) was obtained from the Environmental Protection Division (EPD)-validated 2015 water loss audit data by dividing "volume from own sources (million gallons per year)" by 365 days to convert values to MGD. One QWS, Hogansville, did not have 2015 water loss audit data. These values were instead self-reported via the survey-based questionnaire.

The 2050 ADD (water withdrawal or purchased water) for each QWS was estimated from each individual county's total municipal and industrial water demand projections. The region's *Water and Wastewater Forecasting Technical Memorandum* included 2050 population data and municipal water demand projections by county (Black & Veatch, 2017). As defined by the Middle Chattahoochee Water Planning Council, the municipal sector includes public and private water withdrawal data for residential, commercial, and small industrial use. County municipal water demand values were allocated to each QWS based on the QWS' current total population served, obtained during the data collection stage. Table A-1 shows population forecasts and 2050 municipal demand by county. QWS 2050 municipal demand estimates are shown in Table A-2.

Because the 2015 ADD values include industrial water use, it is necessary to incorporate the 2050 regional industrial demand projections into the 2050 ADD estimates. The Regional Water Plan (RWP) and Technical Memorandum provided a total regional projection for industrial water use rather than projections by county. However, the U.S. Geological Survey (USGS) report *Estimated Use of Water in Georgia for 2015 and Water-Use Trends, 1985–2015* showed 2015 county-level withdrawals and use by category, including industrial (Painter, 2019). It also reported withdrawals by major public suppliers, and 12 of 15 QWS (lacking Hogansville, Tallapoosa, and Temple) were included in the report. For the QWS lacking USGS data, 2015 total demand values from Table 4-1 are reported. This USGS report was used to calculate the municipally supplied industrial use per county. The county industrial use was allocated to a QWS based on the QWS water use as a percent of the county water use. The 2015 QWS-supplied industrial demand value was then divided by the 2015 regional industrial value (3.77 MGD [Black & Veatch, 2017]) to obtain a

QWS-specific percent. This percent was then applied to the 2050 regional industrial projection (3.95 MGD [Black & Veatch, 2017]) to obtain the 2050 QWS-supplied industrial demand (MGD). Table A-3 shows 2015 withdrawal and use data by county and the estimated 2050 municipally supplied industrial demand values for each QWS.

2.3 Excess Capacity Index

The QWS' capacities were scaled to allow for a comparison of excess capacities. The index was calculated, as applicable, for each QWS for 2015 and 2050 capacities using the following equation:

$$(1) \qquad Index = 1 - \frac{ADD}{Excess\ Capacity}$$

Where:

Excess Capacity = Peak Day Design Capacity - ADD

A comparison of indices provides insight into the magnitude of difference with respect to each QWS' excess capacity. The following index regimes exist, which depend upon the relationship between ADD and excess capacity. Excess capacity, in turn, depends on both ADD and peak day design capacity.

(a) If ADD is zero, the index is 1.
(b) If ADD is greater than zero and less than 50% of the peak day design capacity, the index is a positive value between 0 and 1.
    i. As ADD approaches 50% of the peak day design capacity, the index approaches zero.
    ii. The higher the index in this regime, the more excess capacity the QWS has relative to other QWS.
(c) If ADD is more than 50% but less than 100% of the peak day design capacity, the index is a negative value.
    i. As ADD approaches 100% of the peak day design capacity, the index approaches negative infinity.
    ii. In this regime, the closer the index is to zero, the more excess capacity the QWS has relative to other QWS.
(d) If ADD is more than peak day design capacity, excess capacity is negative. The index was not calculated for this regime because there is no excess capacity sufficiency.

Regime (a) above is not meaningful to this study because the ADD is not zero for the QWS in this region. Regime (b) is meaningful to the Middle Chattahoochee QWS because several QWS' ADD is less than 50% of their peak day design capacity. Regime (c) is also meaningful to the Middle Chattahoochee QWS because six QWS' 2015 ADD and five QWS' 2050 ADD exceed 50% but remain below 100% of their peak day design capacity. Regime (d) applies to Bowdon, Harris County, and Villa Rica because their 2050 ADD exceeds their 2050 peak day design capacity.

Table A-4 shows the 2015 and 2050 peak day design capacity, ADD, resultant excess capacity, and calculated excess capacity index, as applicable, for each QWS. The six QWS with the lowest 2015 excess capacity sufficiency, as defined by Regime (c), are Villa Rica, Harris County, West Point, Carroll County, Haralson County, and Bowdon. Bowdon, Harris County, and Villa Rica have no 2050 excess capacity sufficiency, as defined by Regime (d). The next five QWS with the lowest 2050 excess capacity sufficiency, as defined by Regime (c), are Carroll County, West Point, Bremen, LaGrange, and Columbus.

References

Black & Veatch, 2017. *Middle Chattahoochee Water Planning Region: Water and Wastewater Forecasting Technical Memorandum*. February 15, 2017.

Painter, 2019. *Estimated Use of Water in Georgia for 2015 and Water-Use Trends, 1985–2015*. U.S. Geological Survey Open-File Report 2019–1086.

Table A-1

Population Forecasts and 2050 Municipal Demand by County

County	2015 Population Forecast[1]	2050 Population Forecast[1]	2050 Municipal Demand Forecast (MGD)[1]
Carroll	115,587	172,143	21.17
Chattahoochee	12,983	14,020	9.71
Clay	3,013	2,243	0.23
Haralson	28,869	31,871	2.28
Harris	33,451	49,233	6.21
Heard	11,630	10,554	1.18
Muscogee	206,058	238,600	49.32
Quitman	2,351	2,229	0.16
Randolph	7,076	4,263	0.57
Stewart	5,782	4,999	1.17
Troup	70,569	95,153	15.90
Totals	**497,369**	**625,308**	**107.90**

Prepared by: GJH 02/04/21

Checked by: LCT 02/11/21

Notes:

MGD - million gallons per day

1. Values are from the 2017 Black & Veatch *Middle Chattahoochee Water Planning Region: Water and Wastewater Forecasting Technical Memorandum*.

Table A-2
2050 Municipal Demand Estimates

County	Qualified Water System (QWS)	Estimated Population Directly Served[1]	Estimated Consecutive Population Served[2]	Estimated Total Population	Serves Out-of-County Population	QWS Percent of County Population (%)[3]	QWS 2050 Municipal Demand Estimate (MGD)[4]
Carroll	Bowdon	5,400	0	5,400		5%	0.99
Haralson	Bremen	6,200	0	6,200		21%	0.49
Carroll	Carroll County	46,000	14,600	60,600	◊	52%	11.10
Carroll	Carrollton	26,000	0	26,000		22%	4.76
Muscogee	Columbus	200,000	6,200	206,200	◊	100%	49.35
Randolph	Cuthbert	3,700	0	3,700		52%	0.30
Haralson	Haralson County	10,600	8,100	18,700	◊	65%	1.48
Harris	Harris County	22,900	100	23,000		69%	4.27
Heard	Heard County	7,900	400	8,300	◊	71%	0.84
Troup	Hogansville	3,400	100	3,500	◊	5%	0.79
Troup	LaGrange	42,000	3,000	45,000	◊	64%	10.14
Haralson	Tallapoosa	3,500	0	3,500		12%	0.28
Carroll	Temple	4,500	0	4,500		4%	0.82
Carroll	Villa Rica	15,500	0	15,500		13%	2.84
Troup	West Point	5,400	0	5,400		8%	1.22
	Totals	**403,000**	**32,500**	**435,500**	**-**	**-**	**89.66**

Prepared by: GJH 02/05/21

Checked by: LCT 02/11/21

Notes:

MGD - million gallons per day

QWS - qualified water system

1. The population that the system directly sells water to, rounded to the nearest 100.

2. The population benefited from the system's regular sales to another system, rounded to the nearest 100.

3. 2015 county populations presented in Table A-1 and QWS estimated total populations are used to calculate these QWS-specific values.

4. 2050 county municipal demand forecasts presented in Table A-1 and QWS percent of county population values are used to calculate these QWS-specific values.

Table A-3
2015 Withdrawal and Use Data by County and 2050 Industrial Demand Estimates

Regional Water Plan - 2015 Regional Industrial Projection[1]	3.77 MGD
Regional Water Plan - 2050 Regional Industrial Projection[1]	3.95 MGD

Bowdon

Carroll County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.36	7.78	6.42
Commercial	0.00	1.65	1.65
Industrial	0.00	1.31	1.31
Water Loss	-	-	1.94
Inter-County Delivery	-	-	0.00
		Total (MGD)	11.32
		Bowdon Public Supply (MGD)	0.55
		QWS's Percent of County's Public Supply (%)	5%
		QWS's Supplied Industrial Demand (MGD)	0.06
		2015 QWS Percent of Regional Industrial Demand (%)	1.69%
		2050 QWS Industrial Demand Estimate (MGD)	0.07

Bremen

Haralson County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.38	1.98	1.60
Commercial	0.00	0.46	0.46
Industrial	0.00	0.05	0.05
Water Loss	-	-	0.42
Inter-County Delivery	-	-	-0.20
		Total (MGD)	2.33
		Bremen Public Supply (MGD)	0.27
		QWS's Percent of County's Public Supply (%)	12%
		QWS's Supplied Industrial Demand (MGD)	0.01
		2015 QWS Percent of Regional Industrial Demand (%)	0.15%
		2050 QWS Industrial Demand Estimate (MGD)	0.01

Carroll County

Carroll County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.36	7.78	6.42
Commercial	0.00	1.65	1.65
Industrial	0.00	1.31	1.31
Water Loss	-	-	1.94
Inter-County Delivery	-	-	0.00
		Total (MGD)	11.32
		Carroll County Public Supply (MGD)	4.77
		QWS's Percent of County's Public Supply (%)	42%
		QWS's Supplied Industrial Demand (MGD)	0.55
		2015 QWS Percent of Regional Industrial Demand (%)	14.64%
		2050 QWS Industrial Demand Estimate (MGD)	0.58

Carrollton

Carroll County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.36	7.78	6.42
Commercial	0.00	1.65	1.65
Industrial	0.00	1.31	1.31
Water Loss	-	-	1.94
Inter-County Delivery	-	-	0.00
		Total (MGD)	11.32
		Carrollton Public Supply (MGD)	4.98
		QWS's Percent of County's Public Supply (%)	44%
		QWS's Supplied Industrial Demand (MGD)	0.58
		2015 QWS Percent of Regional Industrial Demand (%)	15.29%
		2050 QWS Industrial Demand Estimate (MGD)	0.60

Table A-3
2015 Withdrawal and Use Data by County and 2050 Industrial Demand Estimates

Columbus

Muscogee County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.00	17.03	17.03
Commercial	0.00	6.35	6.35
Industrial	0.00	1.72	1.72
Water Loss	-	-	11.67
Inter-County Delivery	-	-	6.52
		Total (MGD)	43.29
		Columbus Public Supply	34.95
		QWS's Percent of County's Public Supply (%)	81%
		QWS's Supplied Industrial Demand (MGD)	1.39
		2015 QWS Percent of Regional Industrial Demand (%)	36.83%
		2050 QWS Industrial Demand Estimate (MGD)	1.45

Cuthbert

Randolph County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.16	0.76	0.60
Commercial	0.00	0.12	0.12
Industrial	0.17	0.17	0.00
Water Loss	-	-	0.16
Inter-County Delivery	-	-	0.00
		Total (MGD)	0.88
		Cuthbert Public Supply (MGD)	0.49
		QWS's Percent of County's Public Supply (%)	56%
		QWS's Supplied Industrial Demand (MGD)	0.00
		2015 QWS Percent of Regional Industrial Demand (%)	0.00%
		2050 QWS Industrial Demand Estimate (MGD)	0.00

Haralson County

Haralson County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.38	1.98	1.60
Commercial	0.00	0.46	0.46
Industrial	0.00	0.05	0.05
Water Loss	-	-	0.42
Inter-County Delivery	-	-	-0.20
		Total (MGD)	2.33
		Haralson County Public Supply (MGD)	2.26
		QWS's Percent of County's Public Supply (%)	97%
		QWS's Supplied Industrial Demand (MGD)	0.05
		2015 QWS Percent of Regional Industrial Demand (%)	1.29%
		2050 QWS Industrial Demand Estimate (MGD)	0.05

Harris County

Harris County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.58	2.74	2.16
Commercial	0.07	0.19	0.12
Industrial	0.00	0.94	0.94
Water Loss	-	-	3.04
Inter-County Delivery	-	-	2.83
		Total (MGD)	9.09
		Harris County Public Supply (MGD)	1.93
		QWS's Percent of County's Public Supply (%)	21%
		QWS's Supplied Industrial Demand (MGD)	0.20
		2015 QWS Percent of Regional Industrial Demand (%)	5.29%
		2050 QWS Industrial Demand Estimate (MGD)	0.21

Table A-3
2015 Withdrawal and Use Data by County and 2050 Industrial Demand Estimates

Heard County

Heard County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.15	0.65	0.50
Commercial	0.00	0.46	0.46
Industrial	0.00	0.00	0.00
Water Loss	-	-	0.26
Inter-County Delivery	-	-	0.00
		Total (MGD)	1.22
		Heard County Public Supply	1.12
		QWS's Percent of County's Public Supply (%)	92%
		QWS's Supplied Industrial Demand (MGD)	0.00
		2015 QWS Percent of Regional Industrial Demand (%)	0.00%
		2050 QWS Industrial Demand Estimate (MGD)	0.00

Hogansville

Troup County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.52	5.04	3.52
Commercial	0.01	2.02	2.01
Industrial	0.00	1.74	1.74
Water Loss	-	-	1.27
Inter-County Delivery	-	-	0.00
		Total (MGD)	8.54
		Hogansville Public Supply (MGD)[3]	0.51
		QWS's Percent of County's Public Supply (%)	6%
		QWS's Supplied Industrial Demand (MGD)	0.10
		2015 QWS Percent of Regional Industrial Demand (%)	2.75%
		2050 QWS Industrial Demand Estimate (MGD)	0.11

LaGrange

Troup County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.52	5.04	3.52
Commercial	0.01	2.02	2.01
Industrial	0.00	1.74	1.74
Water Loss	-	-	1.27
Inter-County Delivery	-	-	0.00
		Total (MGD)	8.54
		LaGrange Public Supply (MGD)	7.35
		QWS's Percent of County's Public Supply (%)	86%
		QWS's Supplied Industrial Demand (MGD)	1.50
		2015 QWS Percent of Regional Industrial Demand (%)	39.72%
		2050 QWS Industrial Demand Estimate (MGD)	1.57

Tallapoosa

Haralson County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	0.38	1.98	1.60
Commercial	0.00	0.46	0.46
Industrial	0.00	0.05	0.05
Water Loss	-	-	0.42
Inter-County Delivery	-	-	-0.20
		Total (MGD)	2.33
		Tallapoosa Public Supply (MGD)[3]	0.57
		QWS's Percent of County's Public Supply (%)	24%
		QWS's Supplied Industrial Demand (MGD)	0.01
		2015 QWS Percent of Regional Industrial Demand (%)	0.32%
		2050 QWS Industrial Demand Estimate (MGD)	0.01

Table A-3
2015 Withdrawal and Use Data by County and 2050 Industrial Demand Estimates

Temple

Carroll County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.36	7.78	6.42
Commercial	0.00	1.65	1.65
Industrial	0.00	1.31	1.31
Water Loss	-	-	1.94
Inter-County Delivery	-	-	0.00
		Total (MGD)	11.32
		Temple Public Supply (MGD)[3]	0.29
		QWS's Percent of County's Public Supply (%)	3%
		QWS's Supplied Industrial Demand (MGD)	0.03
		2015 QWS Percent of Regional Industrial Demand (%)	0.90%
		2050 QWS Industrial Demand Estimate (MGD)	0.04

Villa Rica

Carroll County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.36	7.78	6.42
Commercial	0.00	1.65	1.65
Industrial	0.00	1.31	1.31
Water Loss	-	-	1.94
Inter-County Delivery	-	-	0.00
		Total (MGD)	11.32
		Villa Rica Public Supply (MGD)	0.90
		QWS's Percent of County's Public Supply (%)	8%
		QWS's Supplied Industrial Demand (MGD)	0.10
		2015 QWS Percent of Regional Industrial Demand (%)	2.76%
		2050 QWS Industrial Demand Estimate (MGD)	0.11

West Point

Troup County[2]	2015 Total Withdrawal (MGD)	2015 Total Use (MGD)	2015 Total Publicly Supplied (MGD)
Domestic	1.52	5.04	3.52
Commercial	0.01	2.02	2.01
Industrial	0.00	1.74	1.74
Water Loss	-	-	1.27
Inter-County Delivery	-	-	0.00
		Total (MGD)	8.54
		West Point Public Supply (MGD)	1.19
		QWS's Percent of County's Public Supply (%)	14%
		QWS's Supplied Industrial Demand (MGD)	0.24
		2015 QWS Percent of Regional Industrial Demand (%)	6.43%
		2050 QWS Industrial Demand Estimate (MGD)	0.25

Prepared by: GJH 02/05/21
Checked by: LCT 02/11/21

Notes:

MGD - million gallons per day

QWS - qualified water system

1. Values are from the 2017 Black & Veatch *Middle Chattahoochee Water Planning Region:* Water and Wastewater Forecasting Technical Memorandum.

2. Values in the box with thick borders are from Painter, 2019: *Estimated Use of Water in Georgia for 2015 and Water-Use Trends, 1985–2015*.

3. Values do not appear in the 2019 Painter report; rather, 2015 Total Demand values from Table 4-1 are reported.

Table A-4
Excess Capacity Index Values

County	Qualified Water System (QWS)	2015 Peak Day Design Capacity (MGD)	2015 ADD (MGD) (Water Withdrawal Only)[1]	2015 Excess Capacity (MGD)	2015 Excess Capacity Index	2050 Peak Day Design Capacity (MGD)[2]	2050 ADD (MGD) (Water Withdrawal Only)[3]	2050 Excess Capacity (MGD)	2050 Excess Capacity Index
Carroll	Bowdon	1.0	0.5	0.5	-0.02	1.0	1.1	-0.1	-
Haralson	Bremen	0.8	0.2	0.6	0.56	0.8	0.5	0.3	-0.63
Carroll	Carroll County	8.6	4.6	4.0	-0.16	12.6	11.7	0.9	-12.10
Carroll	Carrollton	12.0	4.5	7.5	0.40	12.0	5.4	6.6	0.19
Muscogee	Columbus	100.0	30.6	69.4	0.56	100.0	50.8	49.2	-0.03
Randolph	Cuthbert	3.8	0.6	3.3	0.83	3.8	0.3	3.5	0.92
Haralson	Haralson County	3.7	2.0	1.7	-0.15	3.7	1.5	2.2	0.30
Harris	Harris County	3.1	1.6	1.4	-0.21	3.1	4.5	-1.5	-
Heard	Heard County	3.0	1.1	1.9	0.39	4.0	0.8	3.2	0.73
Troup	Hogansville	NA	NA	NA	NA	NA	NA	NA	NA
Troup	LaGrange	20.0	6.4	13.6	0.53	20.0	11.7	8.3	-0.41
Haralson	Tallapoosa	NA	NA	NA	NA	NA	NA	NA	NA
Carroll	Temple	NA	NA	NA	NA	NA	NA	NA	NA
Carroll	Villa Rica	1.5	0.9	0.6	-0.54	1.5	2.9	-1.4	-
Troup	West Point	4.2	1.1	1.0	-0.20	4.2	1.5	0.6	-1.34
	Totals	**161.7**	**54.2**	**105.3**	**-**	**166.7**	**92.7**	**71.8**	**-**

Prepared by: GJH 02/05/21

Checked by: LCT 02/11/21

Notes:

ADD - average daily demand

MGD - million gallons per day

1. 2015 EPD-validated water loss audit values are reported. In the event a QWS is not in that dataset, as identified in Table 2-3, QWS-provided values are reported.
2. Carroll County indicated expanding a WTP by 4 MGD; Heard County indicated expanding a WTP by 1 MGD.
3. Municipal and publicly-supplied industrial demand by county were allocated to each QWS.

Appendix B: Water Supply Deficit Calcuations

Table B-1a
Bowdon Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)[3]		Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				Bowdon WTP	Tisinger Reservoir	Indian Creek					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.00	4.10	0.40	0.63	0.45	2.08	1.00	1.08
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.00	4.10	0.40	0.63	NA	1.63	0.00	1.63
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.00	4.10	0.40	0.63	0.45	2.08	1.00	1.08
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.00	4.10	0.40	0.63	NA	1.63	0.00	1.63
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.00	4.10	0.40	0.63	0.60	2.23	1.00	1.23
	D2. Chemical contamination of largest raw water source	0.1	1	1.00	4.10	0.40	0.63	0.60	2.23	1.00	1.23
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.05	30	1.00	4.10	0.40	0.63	NA	1.63	1.00	0.63
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought[6]	0.1	120	1.00	4.10	0.40	0.63	NA	0.84	-	0.84

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 04/22/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The WTP does not have a backup generator, rendering full capacity loss.
2. The WTP met chemical and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. The interconnection with Carroll County is not limited by their permit withdrawal limits.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
6. Tisinger Reservoir is in Hydrologic Unit Code-10 "Indian Creek," which is less than 100 square miles and Turkey Creek at the withdrawal point is Strahler Stream Order 3 (not a major river). Purchased water is still available because Carroll County would not suffer from Risk H.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-1b
Bowdon Deficits: 2015

Risk	Scenario	Available Water Supply (MGD)	2015 - Immediate Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	1.08	0.50	0.33	0.18	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	1.63	0.50	0.33	0.18	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.08	0.50	0.33	0.18	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.63	0.50	0.33	0.18	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.23	0.50	0.33	0.18	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.23	0.50	0.33	0.18	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.63	0.50	0.33	0.18	0.00	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	0.84	0.50	0.33	0.18	0.00	0.00	0.00

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/04/21

Table B-1c
Bowdon Emergency Scenario Evaluation: 2050

				Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)[3]						
Risk	**Scenario**	**Relative Liklihood**	**Duration (Days)**	**Bowdon WTP**	**Tisinger Reservoir**	**Indian Creek**	**Maximum Possible Purchased Water (MGD)[4]**	**Water Storage (MGD)[5]**	**Total Possible Water Supply (MGD)**	**Capacity Loss (MGD)**	**Available Water Supply (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	0.5	1	1.00	4.10	0.40	0.63	0.75	2.38	0.20	2.18
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.00	4.10	0.40	0.63	NA	1.63	0.00	1.63
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.00	4.10	0.40	0.63	0.75	2.38	1.00	1.38
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.00	4.10	0.40	0.63	NA	1.63	0.00	1.63
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	1.00	4.10	0.40	0.63	0.90	2.53	1.00	1.53
	D2. Chemical contamination of largest raw water source	0.1	1	1.00	4.10	0.40	0.63	0.90	2.53	1.00	1.53
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.05	30	1.00	4.10	0.40	0.63	NA	1.63	1.00	0.63
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought[6]	0.1	120	1.00	4.10	0.40	0.63	NA	1.63	-	1.63

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 03/04/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The QWS indicated obtaining a portable generator, so 20% capacity loss was assumed.
2. The WTP met chemical and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. The interconnection with Carroll County is not limited by their permit withdrawal limits.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage. Bowdon indicated a new 0.5 MG storage tank.
6. Tisinger Reservoir is in Hydrologic Unit Code-10 "Indian Creek," which is less than 100 square miles and Turkey Creek at the withdrawal point is Strahler Stream Order 3 (not a major river). Purchased water is still available because Carroll County would not suffer from Risk H.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-1d
Bowdon Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	2.18	1.06	0.69	0.37	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	1.63	1.06	0.69	0.37	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.38	1.06	0.69	0.37	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.63	1.06	0.69	0.37	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	1.53	1.06	0.69	0.37	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	1.53	1.06	0.69	0.37	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.63	1.06	0.69	0.37	0.42	0.05	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	1.63	1.06	0.69	0.37	0.00	0.00	0.00

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/04/21

Table B-1e
Bowdon Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)
1	GA0450001-Carroll County	Garrett Circle and Hwy 166	6	5	0.982	0.635	0.000	0.635

Prepared by: GJH 02/22/21
Checked by: LCT 03/04/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.

Table B-2a
Bremen Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)[4]	Maximum Possible Purchased Water (MGD)[5]	Water Storage (MGD)[6]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				Bremen WTP	Beach Creek and Bremen Reservoir					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.80	0.80	2.54	0.75	4.09	0.00	4.09
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.80	0.80	2.54	NA	3.34	0.00	3.34
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[3]	0.1	1	0.80	0.80	2.54	0.75	4.09	2.54	1.55
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.0	3	0.80	0.80	2.54	NA	3.34	0.00	3.34
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.80	0.80	2.54	1.10	4.43	0.80	3.63
	D2. Chemical contamination of largest raw water source	0.1	1	0.80	0.80	2.54	1.10	4.43	0.80	3.63
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.05	30	0.80	0.80	2.54	NA	3.34	0.80	2.54
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[7]								

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. Bremen WTP has a backup generator able to supply full capacity, rendering no capacity loss.
2. The WTP met chemical and unit process redundancy, rendering no capacity loss.
3. Their interconnection with Haralson County was deemed a critical asset. The maximum possible purchased water value via the interconnection is reported because it is greater than Bremen WTP's capacity.
4. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
5. The interconnection with Haralson County is not limited by their permit withdrawal limits.
6. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
7. Their reservoir is in Hydrologic Unit Code-10 "Beach Creek-Tallapoosa River," which is more than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 02/22/21
Checked by: LCT 03/04/21

Table B-2b
Bremen Deficits: 2015

Risk	Scenario	Available Water Supply (MGD)	2015 - Immediate Reliability Target					
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)	Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	4.09	0.91	0.59	0.32	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.34	0.91	0.59	0.32	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.55	0.91	0.59	0.32	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	3.34	0.91	0.59	0.32	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	3.63	0.91	0.59	0.32	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	3.63	0.91	0.59	0.32	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	2.54	0.91	0.59	0.32	0.00	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/04/21

Table B-2c
Bremen Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) Bremen WTP	Peak Permitted Withdrawal (MGD-24-hour maximum)[4] Beach Creek and Bremen Reservoir	Maximum Possible Purchased Water (MGD)[5]	Water Storage (MGD)[6]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.80	0.80	4.30	0.75	5.85	0.00	5.85
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.80	0.80	4.30	NA	5.10	0.00	5.10
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[3]	0.1	1	0.80	0.80	4.30	0.75	5.85	2.54	3.31
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.0	3	0.80	0.80	4.30	NA	5.10	0.00	5.10
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.80	0.80	4.30	1.10	6.20	0.80	5.40
	D2. Chemical contamination of largest raw water source	0.1	1	0.80	0.80	4.30	1.10	6.20	0.80	5.40
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.05	30	0.80	0.80	4.30	NA	5.10	0.80	4.30
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[7]								

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 03/04/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. Bremen WTP has a backup generator able to supply full capacity, rendering no capacity loss.
2. The WTP met chemical and unit process redundancy, rendering no capacity loss.
3. Their interconnection with Haralson County was deemed a critical asset. The maximum possible purchased water value via the interconnection is reported because it is greater than Bremen WTP's capacity.
4. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
5. The interconnection with Haralson County and future interconnection with Carroll County are not limited by their permit withdrawal limits.
6. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
7. Their reservoir is in Hydrologic Unit Code-10 "Beach Creek-Tallapoosa River," which is more than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-2d
Bremen Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	5.85	0.50	0.32	0.17	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	5.10	0.50	0.32	0.17	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.31	0.50	0.32	0.17	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	5.10	0.50	0.32	0.17	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	5.40	0.50	0.32	0.17	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	5.40	0.50	0.32	0.17	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	4.30	0.50	0.32	0.17	0.00	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/04/21

Table B-2e
Bremen Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)
2	GA1430007-Haralson County	Highway 78 on West Side of Bremen	12	5	3.927	2.538	0.668	2.538

Future Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)
3	GA0450001-Carroll County	Alabama Ave & Price Creek Rd	10	5	2.727	1.763	0.000	1.763

Prepared by: GJH 02/22/21
Checked by: LCT 03/04/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.

Table B-3a
Carroll County Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)				Peak Permitted Withdrawal (MGD-24-hour maximum)[3]	Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				Snake Creek WTP	WTP Well 105	WTP Well 107	WTP Well 108	Snake Creek Reservoir					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	8.00	0.41	0.11	0.05	13.00	5.19	3.87	17.62	0.00	17.62
	A2. Critical asset failure at largest WTP[2]	0.1	30	8.00	0.41	0.11	0.05	13.00	5.19	NA	13.75	0.00	13.75
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	8.00	0.41	0.11	0.05	13.00	5.19	3.87	17.62	8.00	9.62
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	8.00	0.41	0.11	0.05	13.00	5.19	NA	13.75	0.00	13.75
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	8.00	0.41	0.11	0.05	13.00	5.19	4.77	18.52	8.00	10.52
	D2. Chemical contamination of largest raw water source	0.1	1	8.00	0.41	0.11	0.05	13.00	5.19	4.77	18.52	8.00	10.52
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.05	30	8.00	0.41	0.11	0.05	13.00	5.19	NA	13.75	8.00	5.75
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[6]											

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. Snake Creek WTP has backup generators able to supply full capacity, rendering no capacity loss.
2. Snake Creek WTP met chemical and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Carroll County's interconnections are not limited by their suppliers' permit withdrawal limits.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
6. Snake Creek Reservoir is in Hydrologic Unit Code-10 "Dog River-Chattahoochee River," which is more than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-3b
Carroll County Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	17.62	4.60	2.99	1.61	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	13.75	4.60	2.99	1.61	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	9.62	4.60	2.99	1.61	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	13.75	4.60	2.99	1.61	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	10.52	4.60	2.99	1.61	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	10.52	4.60	2.99	1.61	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	5.75	4.60	2.99	1.61	0.00	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-3c
Carroll County Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)				Peak Permitted Withdrawal (MGD-24-hour maximum)[3]	Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				Snake Creek WTP	WTP Well 105	WTP Well 107	WTP Well 108	Snake Creek Reservoir					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	12.00	0.41	0.11	0.05	13.00	5.19	4.47	22.22	0.00	22.22
	A2. Critical asset failure at largest WTP[2]	0.1	30	12.00	0.41	0.11	0.05	13.00	5.19	NA	17.75	0.00	17.75
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	12.00	0.41	0.11	0.05	13.00	5.19	4.47	22.22	12.00	10.22
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	12.00	0.41	0.11	0.05	13.00	5.19	NA	17.75	0.00	17.75
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	12.00	0.41	0.11	0.05	13.00	5.19	5.37	23.12	12.00	11.12
	D2. Chemical contamination of largest raw water source	0.1	1	12.00	0.41	0.11	0.05	13.00	5.19	5.37	23.12	12.00	11.12
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable											
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.05	30	12.00	0.41	0.11	0.05	13.00	5.19	NA	17.75	12.00	5.75
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[6]											

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. Snake Creek WTP has backup generators able to supply full capacity, rendering no capacity loss.
2. Snake Creek WTP met chemical and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Carroll County's interconnections are not limited by their suppliers' permit withdrawal limits.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage. Carroll County indicated two new 0.5 MG storage tanks.
6. Snake Creek Reservoir is in Hydrologic Unit Code-10 "Dog River-Chattahoochee River," which is more than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-3d
Carroll County Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	22.22	11.68	7.59	4.09	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	17.75	11.68	7.59	4.09	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	10.22	11.68	7.59	4.09	1.45	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	17.75	11.68	7.59	4.09	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	11.12	11.68	7.59	4.09	0.55	0.00	0.00
	D2. Chemical contamination of largest raw water source	11.12	11.68	7.59	4.09	0.55	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	5.75	11.68	7.59	4.09	5.92	1.84	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-3e
Carroll County Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[2]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)[3]
4	GA1430007-Haralson County	Hill View Road	6	5	0.982	0.635	0.000	0.635
5	GA0450000-Bowdon	Reynolds Road and Smithfield Road	6	5	0.982	0.635	0.000	0.635
6	GA0450002-Carrollton	Highway 16	4	5	0.436	0.282	0.000	0.200
7	GA0450002-Carrollton	Old Bremen Road	6	5	0.982	0.635	0.000	0.300
8	GA0450002-Carrollton	Mote Road	6	5	0.982	0.635	0.000	0.300
9	GA0450002-Carrollton	Hays Mill Road	4	5	0.436	0.282	0.000	0.200
10	GA0450002-Carrollton	Bankhead Highway	6	5	0.982	0.635	0.000	0.300
11	GA0450002-Carrollton	Old Newnan Road	4	5	0.436	0.282	0.000	0.200
12	GA0450002-Carrollton	Whooping Creek Road	6	5	0.982	0.635	0.000	0.300
13	GA0450002-Carrollton	Mt Zion Road	8	5	1.745	1.128	0.000	0.450
14	GA0450002-Carrollton	Piney Grove Road	6	5	0.982	0.635	0.000	0.300
15	GA0450002-Carrollton	Shady Grove Road	8	5	1.745	1.128	0.000	0.450
16	AL0001761-Cleburne County[1]	In Alabama along High Point Road/AL-County Road 37	6	5	1.745	0.635	0.000	0.635
17	GA1490000-Heard County	South side of Carroll County	4	5	0.436	0.282	0.000	0.282

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The system's permits and ADD were not obtained. Therefore, these are assumed values based on pipe diameter and may be in excess of what the system can functionally provide.
2. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.
3. Maximum flow values may differ because the QWS reported certain values as the maximum possible purchased water. The more conservative values were chosen.

Table B-4a
Carrollton Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)[3]	Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				Carrollton WTP	Little Tallapoosa River					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	12.00	12.00	3.00	6.60	21.60	7.20	14.40
	A2. Critical asset failure at largest WTP[2]	0.1	30	12.00	12.00	3.00	NA	15.00	12.00	3.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	12.00	12.00	3.00	6.60	21.60	12.00	9.60
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.0	3	12.00	12.00	3.00	NA	15.00	0.00	15.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source[6]	0.5	1	12.00	12.00	3.00	7.50	22.50	0.00	22.50
	D2. Chemical contamination of largest raw water source[6]	0.1	1	12.00	12.00	3.00	7.50	22.50	0.00	22.50
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment[6]	0.05	30	12.00	12.00	3.00	NA	15.00	0.00	15.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[7]								

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. Carrollton WTP has a backup generator able to supply 4.8 MGD capacity, rendering partial capacity loss.
2. Did not meet unit process redundancy for coagulation units, rendering full capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Their interconnections with Carroll County are not limited by their permit withdrawal limits.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
6. Carrollton WTP can withdraw water from three reservoirs, each approximately 6 MG. If one is contaminated or one dam fails, there is no capacity loss.
7. Their reservoir is in Hydrologic Unit Code-10 "Buck Creek-Little Tallapoosa River," which is more than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-4b
Carrollton Deficits: 2015

Risk	Scenario	Available Water Supply (MGD)	2015 - Immediate Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	14.40	4.48	2.91	1.57	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.00	4.48	2.91	1.57	1.48	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	9.60	4.48	2.91	1.57	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	15.00	4.48	2.91	1.57	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	22.50	4.48	2.91	1.57	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	22.50	4.48	2.91	1.57	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	15.00	4.48	2.91	1.57	0.00	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-4c
Carrollton Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)[3]	Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				Carrollton WTP	Little Tallapoosa River					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	12.00	12.00	3.00	6.90	21.90	7.20	14.70
	A2. Critical asset failure at largest WTP[2]	0.1	30	12.00	12.00	3.00	NA	15.00	12.00	3.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	12.00	12.00	3.00	6.90	21.90	12.00	9.90
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1.0	3	12.00	12.00	3.00	NA	15.00	0.00	15.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source[6]	0.5	1	12.00	12.00	3.00	7.80	22.80	0.00	22.80
	D2. Chemical contamination of largest raw water source[6]	0.1	1	12.00	12.00	3.00	7.80	22.80	0.00	22.80
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment[6]	0.05	30	12.00	12.00	3.00	NA	15.00	0.00	15.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[7]								

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. Carrollton WTP has a backup generator able to supply 4.8 MGD capacity, rendering partial capacity loss.
2. Did not meet unit process redundancy for coagulation units, rendering full capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Their interconnections with Carroll County are not limited by their permit withdrawal limits.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage. Carrollton indicated a new 0.5 MG storage tank.
6. Carrollton WTP can withdraw water from three reservoirs, each approximately 6 MG. If one is contaminated or one dam fails, there is no capacity loss.
7. Their reservoir is in Hydrologic Unit Code-10 "Buck Creek-Little Tallapoosa River," which is more than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-4d
Carrollton Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	14.70	5.37	3.49	1.88	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.00	5.37	3.49	1.88	2.37	0.49	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	9.90	5.37	3.49	1.88	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	15.00	5.37	3.49	1.88	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	22.80	5.37	3.49	1.88	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	22.80	5.37	3.49	1.88	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	15.00	5.37	3.49	1.88	0.00	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-4e
Carrollton Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)[2]
6	GA0450001-Carroll County	Highway 16	4	5	0.436	0.282	0.000	0.200
7	GA0450001-Carroll County	Old Bremen Road	6	5	0.982	0.635	0.000	0.300
8	GA0450001-Carroll County	Mote Road	6	5	0.982	0.635	0.000	0.300
9	GA0450001-Carroll County	Hays Mill Road	4	5	0.436	0.282	0.000	0.200
10	GA0450001-Carroll County	Bankhead Highway	6	5	0.982	0.635	0.000	0.300
11	GA0450001-Carroll County	Old Newnan Road	4	5	0.436	0.282	0.000	0.200
12	GA0450001-Carroll County	Whooping Creek Road	6	5	0.982	0.635	0.000	0.300
13	GA0450001-Carroll County	Mt Zion Road	8	5	1.745	1.128	0.000	0.450
14	GA0450001-Carroll County	Piney Grove Road	6	5	0.982	0.635	0.000	0.300
15	GA0450001-Carroll County	Shady Grove Road	8	5	1.745	1.128	0.000	0.450

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.
2. Maximum flow values differ because the QWS reported 3 MGD, which was distributed logically among interconnections, as the maximum possible purchased water. The more conservative values were chosen.

Table B-5a
Columbus Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)		Peak Permitted Withdrawal (MGD-24-hour maximum)[3]		Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				North Columbus WTP	Fort Benning WTP	Lake Oliver (North Columbus WTP)	Chattahoochee River (Fort Benning WTP)					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	90.00	10.00	90.00	12.00	6.09	13.03	119.12	20.00	99.12
	A2. Critical asset failure at largest WTP[2]	0.1	30	90.00	10.00	90.00	12.00	6.09	NA	106.09	0.00	106.09
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	90.00	10.00	90.00	12.00	6.09	13.03	119.12	90.00	29.12
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	90.00	10.00	90.00	12.00	6.09	NA	106.09	0.00	106.09
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	90.00	10.00	90.00	12.00	6.09	28.03	134.12	90.00	44.12
	D2. Chemical contamination of largest raw water source	0.1	1	90.00	10.00	90.00	12.00	6.09	28.03	134.12	90.00	44.12
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable										
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable										
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.05	30	90.00	10.00	90.00	12.00	6.09	NA	106.09	90.00	16.09
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[5]										

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. North Columbus WTP has backup generators able to supply 70 MGD capacity, rendering minor capacity loss at the largest WTP.
2. North Columbus WTP met chemical redundancy and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage. Columbus has 8.5 MG of raw water tanks.
5. Lake Oliver is in Hydrologic Unit Code-10 "Standing Boy Creek-Chattahoochee River," which is greater than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-5b
Columbus Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	99.12	30.57	19.87	10.70	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	106.09	30.57	19.87	10.70	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	29.12	30.57	19.87	10.70	1.45	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	106.09	30.57	19.87	10.70	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	44.12	30.57	19.87	10.70	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	44.12	30.57	19.87	10.70	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	16.09	30.57	19.87	10.70	14.48	3.78	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought				Not Applicable			

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-5c
Columbus Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)		Peak Permitted Withdrawal (MGD-24-hour maximum)[3]		Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				North Columbus WTP	Fort Benning WTP	Lake Oliver (North Columbus WTP)	Chattahoochee River (Fort Benning WTP)					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	90.00	10.00	90.00	12.00	6.09	13.03	119.12	20.00	99.12
	A2. Critical asset failure at largest WTP[2]	0.1	30	90.00	10.00	90.00	12.00	6.09	NA	106.09	0.00	106.09
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	90.00	10.00	90.00	12.00	6.09	13.03	119.12	90.00	29.12
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	90.00	10.00	90.00	12.00	6.09	NA	106.09	0.00	106.09
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	90.00	10.00	90.00	12.00	6.09	28.03	134.12	90.00	44.12
	D2. Chemical contamination of largest raw water source	0.1	1	90.00	10.00	90.00	12.00	6.09	28.03	134.12	90.00	44.12
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable										
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable										
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.05	30	90.00	10.00	90.00	12.00	6.09	NA	106.09	90.00	16.09
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[5]										

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. North Columbus WTP has backup generators able to supply 70 MGD capacity, rendering minor capacity loss at the largest WTP.
2. North Columbus WTP met chemical redundancy and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage. Columbus has 8.5 MG of raw water tanks.
5. Lake Oliver is in Hydrologic Unit Code-10 "Standing Boy Creek-Chattahoochee River," which is greater than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-5d
Columbus Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	99.12	50.81	33.03	17.78	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	106.09	50.81	33.03	17.78	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	29.12	50.81	33.03	17.78	21.69	3.91	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	106.09	50.81	33.03	17.78	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	44.12	50.81	33.03	17.78	6.69	0.00	0.00
	D2. Chemical contamination of largest raw water source	44.12	50.81	33.03	17.78	6.69	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	16.09	50.81	33.03	17.78	34.72	16.93	1.69
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-5e
Columbus Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[2]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)[3]
18	AL0001142-Phenix City[1]	Pipeline across Chattahoochee River	24	3	9.425	6.091	0.000	6.091

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The system's permits and ADD were not obtained. Therefore, these are assumed values based on pipe diameter and may be in excess of what the system can functionally provide.
2. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.
3. The QWS reported 8 MGD as the maximum possible purchased water. The more conservative values were chosen.

Table B-6a
Cuthbert Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) WTP Well 101	WTP Well 102	WTP Well 103	WTP Well 104	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.81	0.75	1.03	1.24	NA	0.60	4.43	0.00	4.43
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.81	0.75	1.03	1.24	NA	NA	3.83	0.00	3.83
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.81	0.75	1.03	1.24	NA	0.60	4.43	1.24	3.19
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.81	0.75	1.03	1.24	NA	NA	3.83	0.00	3.83
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.81	0.75	1.03	1.24	NA	0.60	4.43	1.24	3.19
	D2. Chemical contamination of largest raw water source	0.1	1	0.81	0.75	1.03	1.24	NA	0.60	4.43	1.24	3.19
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable										
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable										
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable										
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable										

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The largest WTP (Well 104) has a backup generator able to supply full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-6b
Cuthbert Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	4.43	0.57	0.37	0.20	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.83	0.57	0.37	0.20	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.19	0.57	0.37	0.20	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	3.83	0.57	0.37	0.20	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	3.19	0.57	0.37	0.20	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	3.19	0.57	0.37	0.20	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-6c
Cuthbert Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)				Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				WTP Well 101	WTP Well 102	WTP Well 103	WTP Well 104					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	0.81	0.75	1.03	1.24	NA	0.60	4.43	0.00	4.43
	A2. Critical asset failure at largest WTP[2]	0.1	30	0.81	0.75	1.03	1.24	NA	NA	3.83	0.00	3.83
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	0.81	0.75	1.03	1.24	NA	0.60	4.43	1.24	3.19
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	0.81	0.75	1.03	1.24	NA	NA	3.83	0.00	3.83
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	0.81	0.75	1.03	1.24	NA	0.60	4.43	1.24	3.19
	D2. Chemical contamination of largest raw water source	0.1	1	0.81	0.75	1.03	1.24	NA	0.60	4.43	1.24	3.19
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable										
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable										
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable										
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable										

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The largest WTP (Well 104) has a backup generator able to supply full capacity, rendering no capacity loss.
2. Backup equipment is available, rendering no capacity loss.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-6d
Cuthbert Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	4.43	0.30	0.19	0.10	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.83	0.30	0.19	0.10	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.19	0.30	0.19	0.10	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	3.83	0.30	0.19	0.10	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	3.19	0.30	0.19	0.10	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	3.19	0.30	0.19	0.10	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-7a
Haralson County Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)		Peak Permitted Withdrawal (MGD-24-hour maximum)[3]	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				Haralson County WTP	WTP Simms Wells	Tallapoosa River					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	3.20	0.52	3.75	3.03	3.92	10.67	0.00	10.67
	A2. Critical asset failure at largest WTP[2]	0.1	30	3.20	0.52	3.75	3.03	NA	6.75	3.20	3.55
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	3.20	0.52	3.75	3.03	3.92	10.67	3.20	7.47
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	3.20	0.52	3.75	3.03	NA	6.75	0.00	6.75
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source[5]	0.5	1	3.20	0.52	3.75	3.03	4.52	11.27	0.00	11.27
	D2. Chemical contamination of largest raw water source[5]	0.1	1	3.20	0.52	3.75	3.03	4.52	11.27	0.00	11.27
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable[6]									
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought[7]	0.1	120	3.20	0.52	3.75	3.03	NA	3.90	-	3.90

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The QWS has a backup portable generator able to supply full capacity, rendering no capacity loss.
2. Did not meet unit process redundancy for coagulation units, rendering full capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
5. Haralson County WTP has a 6 MG raw water pond in addition to pumping from the river. If the Tallapoosa River is contaminated, the pond has sufficient storage for this scenario duration.
6. Their small on-site raw water pond is not a dammed river.
7. The Tallapoosa River at the withdrawal point is Strahler Stream Order 5 (not a major river). Purchased water is assumed to still be available.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-7b
Haralson County Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	10.67	2.17	1.41	0.76	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.55	2.17	1.41	0.76	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	7.47	2.17	1.41	0.76	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	6.75	2.17	1.41	0.76	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	11.27	2.17	1.41	0.76	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	11.27	2.17	1.41	0.76	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	3.90	2.17	1.41	0.76	0.00	0.00	0.00

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-7c
Haralson County Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)		Peak Permitted Withdrawal (MGD-24-hour maximum)[3]	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				Haralson County WTP	WTP Simms Wells	Tallapoosa River					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	3.20	0.52	3.75	3.03	3.92	10.67	0.00	10.67
	A2. Critical asset failure at largest WTP[2]	0.1	30	3.20	0.52	3.75	3.03	NA	6.75	3.20	3.55
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	3.20	0.52	3.75	3.03	3.92	10.67	3.20	7.47
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	3.20	0.52	3.75	3.03	NA	6.75	0.00	6.75
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source[5]	0.5	1	3.20	0.52	3.75	3.03	4.52	11.27	0.00	11.27
	D2. Chemical contamination of largest raw water source[5]	0.1	1	3.20	0.52	3.75	3.03	4.52	11.27	0.00	11.27
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable[6]									
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought[7]	0.1	120	3.20	0.52	3.75	3.03	NA	3.64	-	3.64

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

1. The QWS has a backup portable generator able to supply full capacity, rendering no capacity loss.
2. Did not meet unit process redundancy for coagulation units, rendering full capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
5. Haralson County WTP has a 6 MG raw water pond in addition to pumping from the river. If the Tallapoosa River is contaminated, the pond has sufficient storage for this scenario duration.
6. Their small on-site raw water pond is not a dammed river.
7. The Tallapoosa River at the withdrawal point is Strahler Stream Order 5 (not a major river). Purchased water is assumed to still be available.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-7d
Haralson County Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	10.67	1.53	0.99	0.53	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.55	1.53	0.99	0.53	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	7.47	1.53	0.99	0.53	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	6.75	1.53	0.99	0.53	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	11.27	1.53	0.99	0.53	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	11.27	1.53	0.99	0.53	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	3.64	1.53	0.99	0.53	0.00	0.00	0.00

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-7e
Haralson County Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[3]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)
19	AL0001761-Cleburne County[1]	In Alabama on the west side of Haralson County	8	5	1.745	1.128	0.180	1.128
20	AL0001761-Cleburne County[1]	In Alabama on the west side of Haralson County	6	5	0.982	0.635	0.000	0.635
21	GA2330001-Polk County[2]	North side of Haralson County	6	5	0.982	0.635	0.000	0.635
22	GA0450001-Carroll County[2]	South side of Haralson County	6	5	0.982	0.635	0.000	0.635

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The system's permits and ADD were not obtained. Therefore, these are assumed values based on pipe diameter and may be in excess of what the system can functionally provide.
2. These interconnections are not limited by supplier ADD, permit limits, or peak design capacity.
3. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.

Table B-8a
Harris County Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)[3]					
				Harris County WTP	Lake Harding / Bartlett's Ferry Reservoir	Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	3.10	3.00	4.84	2.52	10.36	3.00	7.36
	A2. Critical asset failure at largest WTP[2]	0.1	30	3.10	3.00	4.84	NA	7.84	0.00	7.84
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	3.10	3.00	4.84	2.52	10.36	3.00	7.36
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	3.10	3.00	4.84	NA	7.84	0.00	7.84
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	3.10	3.00	4.84	2.64	10.48	3.00	7.48
	D2. Chemical contamination of largest raw water source	0.1	1	3.10	3.00	4.84	2.64	10.48	3.00	7.48
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.05	30	3.10	3.00	4.84	NA	7.84	3.00	4.84
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[6]								

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The WTP does not have a backup generator, rendering full capacity loss.
2. The WTP met chemical and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Their interconnections with Columbus and Talbot County are not limited by their permit withdrawal limits.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
6. Lake Harding is in Hydrologic Unit Code-10 "Chattahoochee River-Lake Harding," which is greater than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-8b
Harris County Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	7.36	2.30	1.49	0.80	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	7.84	2.30	1.49	0.80	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	7.36	2.30	1.49	0.80	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	7.84	2.30	1.49	0.80	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	7.48	2.30	1.49	0.80	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	7.48	2.30	1.49	0.80	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	4.84	2.30	1.49	0.80	0.00	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought				Not Applicable			

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-8c
Harris County Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)[3]					
				Harris County WTP	Lake Harding / Bartlett's Ferry Reservoir	Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	3.10	3.00	4.84	2.52	10.36	0.62	9.74
	A2. Critical asset failure at largest WTP[2]	0.1	30	3.10	3.00	4.84	NA	7.84	0.00	7.84
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	3.10	3.00	4.84	2.52	10.36	3.00	7.36
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	3.10	3.00	4.84	NA	7.84	0.00	7.84
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	3.10	3.00	4.84	2.64	10.48	3.00	7.48
	D2. Chemical contamination of largest raw water source	0.1	1	3.10	3.00	4.84	2.64	10.48	3.00	7.48
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	0.05	30	3.10	3.00	4.84	NA	7.84	3.00	4.84
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[6]								

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The QWS indicated obtaining a portable generator, so 20% capacity loss was assumed.
2. The WTP met chemical and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Their interconnections with Columbus and Talbot County are not limited by their permit withdrawal limits.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
6. Lake Harding is in Hydrologic Unit Code-10 "Chattahoochee River-Lake Harding," which is greater than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-8d
Harris County Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	9.74	4.48	2.91	1.57	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	7.84	4.48	2.91	1.57	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	7.36	4.48	2.91	1.57	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	7.84	4.48	2.91	1.57	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	7.48	4.48	2.91	1.57	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	7.48	4.48	2.91	1.57	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	4.84	4.48	2.91	1.57	0.00	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-8e
Harris County Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Booster Station Capacity (MGD)	Maximum Possible Purchased Water (MGD)[2]
23	GA2150000-Columbus	Warm Springs Road	8	5	1.745	1.128	0.093	0.360	0.360
24	GA2150000-Columbus	Mehaffey Road	8	5	1.745	1.128	0.093	0.360	0.360
25	GA2150000-Columbus	Smith/Whitesville Road	8	5	1.745	1.128	0.093	NA	1.128
26	GA2150000-Columbus	County Line Steel Creek	8	5	1.745	1.128	0.093	NA	1.128
27	GA2150000-Columbus	McKee Road	12	5	3.927	2.538	0.093	1.152	1.152
28	GA2150000-Columbus	US-27	12	5	3.927	2.538	0.093	0.432	0.432
29	GA2630005-Tablot County	Ingram Road	4	5	0.436	0.282	0.096	NA	0.282

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
NA - not applicable
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.
2. The QWS included booster pump capacities, which reduce the maximum flow, for several interconnections. The more conservative values were chosen.

Table B-9a
Heard County Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)[3]		Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				Heard County WTP	Hillabahatchee Creek	Centralhatchee Creek					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	3.00	4.00	4.00	0.92	0.91	4.82	3.00	1.82
	A2. Critical asset failure at largest WTP[2]	0.1	30	3.00	4.00	4.00	0.92	NA	3.92	0.00	3.92
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	3.00	4.00	4.00	0.92	0.91	4.82	3.00	1.82
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	3.00	4.00	4.00	0.92	NA	3.92	0.00	3.92
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source[6]	0.5	1	3.00	4.00	4.00	0.92	1.20	5.11	0.00	5.11
	D2. Chemical contamination of largest raw water source[6]	0.1	1	3.00	4.00	4.00	0.92	1.20	5.11	0.00	5.11
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment[6]	0.05	30	3.00	4.00	4.00	0.92	NA	3.92	0.00	3.92
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[7]									

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The WTP does not have a backup generator, rendering full capacity loss.
2. The WTP met chemical and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Their interconnections with Coweta County and Carroll County are not limited by their permit withdrawal limits.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
6. Heard WTP can withdraw water from two creeks, each permitted 4 MGD. One can pump directly to the WTP, and both can pump directly to an onsite reservoir (15 MG). If one source is contaminated or if the reservoir dam fails, there is no capacity loss.
7. Heard County's reservoir is in Hydrologic Unit Code-10 "Centralhatchee Creek-Chattahoochee River," which is greater than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-9b
Heard County Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	1.82	1.14	0.74	0.40	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	3.92	1.14	0.74	0.40	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.82	1.14	0.74	0.40	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	3.92	1.14	0.74	0.40	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	5.11	1.14	0.74	0.40	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	5.11	1.14	0.74	0.40	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--				Not Applicable			
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	3.92	1.14	0.74	0.40	0.00	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought				Not Applicable			

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-9c
Heard County Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)[3]		Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
				Heard County WTP	Hillabahatchee Creek	Centralhatchee Creek					
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	4.00	4.00	4.00	0.92	0.91	5.82	4.00	1.82
	A2. Critical asset failure at largest WTP[2]	0.1	30	4.00	4.00	4.00	0.92	NA	4.92	0.00	4.92
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	4.00	4.00	4.00	0.92	0.91	5.82	4.00	1.82
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	4.00	4.00	4.00	0.92	NA	4.92	0.00	4.92
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source[6]	0.5	1	4.00	4.00	4.00	0.92	1.20	6.11	0.00	6.11
	D2. Chemical contamination of largest raw water source[6]	0.1	1	4.00	4.00	4.00	0.92	1.20	6.11	0.00	6.11
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable									
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment[6]	0.05	30	4.00	4.00	4.00	0.92	NA	4.92	0.00	4.92
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[7]									

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The WTP does not have a backup generator, rendering full capacity loss.
2. The WTP met chemical and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Their interconnections with Coweta County and Carroll County are not limited by their permit withdrawal limits.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
6. Heard WTP can withdraw water from two creeks, each permitted 4 MGD. One can pump directly to the WTP, and both can pump directly to an onsite reservoir (15 MG). If one source is contaminated or if the reservoir dam fails, there is no capacity loss.
7. Heard County's reservoir is in Hydrologic Unit Code-10 "Centralhatchee Creek-Chattahoochee River," which is greater than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-9d
Heard County Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	1.82	0.84	0.55	0.29	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	4.92	0.84	0.55	0.29	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.82	0.84	0.55	0.29	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	4.92	0.84	0.55	0.29	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	6.11	0.84	0.55	0.29	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	6.11	0.84	0.55	0.29	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	4.92	0.84	0.55	0.29	0.00	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-9e
Heard County Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)
17	GA0450001-Carroll County	North side of Heard County	4	5	0.436	0.282	0.000	0.282
30	GA0770042-Coweta County	East side of Heard County	6	5	0.982	0.635	0.000	0.635

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
NA - not applicable
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.

Table B-10a
Hogansville Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[1]	0.1	1	4.04	0.28	4.32	2.54	1.78
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice[2]	1	3	4.04	NA	4.04	0.00	4.04
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. Hogansville is interconnected with Coweta County and LaGrange. It was assumed that the largest interconnection fails.
2. Hogansville is interconnected with Coweta County and LaGrange. It was assumed that both interconnections can supply full capacity.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-10b
Hogansville Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.78	0.51	0.33	0.18	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	4.04	0.51	0.33	0.18	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-10c
Hogansville Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[3]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[1]	0.1	1	4.04	0.28	4.32	2.54	1.78
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice[2]	1	3	4.04	NA	4.04	0.00	4.04
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. Hogansville is interconnected with Coweta County and LaGrange. It was assumed that the largest interconnection fails.
2. Hogansville is interconnected with Coweta County and LaGrange. It was assumed that both interconnections can supply full capacity.
3. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-10d
Hogansville Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	1.78	0.90	0.58	0.31	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	4.04	0.90	0.58	0.31	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-10e
Hogansville Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)[1]	Maximum Velocity (fps)[1]	Maximum Flow (cfs)[1]	Maximum Flow (MGD)[1]	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)[1]
17	GA0770042-Coweta County	North side of Hogansville - Corinth Road	unknown	unknown	2.3	1.5	0.29	1.5
30	GA2850001-LaGrange	South side of Hogansville - US-29	12	5	3.927	2.538	0.22	2.538

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
NA - not applicable
1. Pipe diameter and velocitiy and unknown. Maximum flow values were reported in the 2018 Hogansville Sanitary Survey.

Table B-11a
LaGrange Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)[3]					
				LaGrange WTP	West Point Lake	Maximum Possible Purchased Water (MGD)	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	20.00	22.00	NA	3.06	23.06	4.00	19.06
	A2. Critical asset failure at largest WTP[2]	0.1	30	20.00	22.00	NA	NA	20.00	0.00	20.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	20.00	22.00	NA	3.06	23.06	20.00	3.06
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	20.00	22.00	NA	NA	20.00	0.00	20.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source[5]	0.5	1	20.00	22.00	NA	3.96	23.96	10.00	13.96
	D2. Chemical contamination of largest raw water source[5]	0.1	1	20.00	22.00	NA	3.96	23.96	10.00	13.96
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment[5]	0.05	30	20.00	22.00	NA	NA	20.00	10.00	10.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[6]								

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The WTP has a generator of unknown capacity, so 20% capacity loss was assumed.
2. The WTP met chemical and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
5. LaGrange WTP has a 12 MG raw water reservoir in addition to pumping from West Point Lake. If West Point Lake is contaminated or if the dam fails, 10 MGD capacity loss was assumed.
6. West Point Lake is in Hydrologic Unit Code-10 "Yellowjacket Creek," which is greater than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-11b
LaGrange Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	19.06	6.44	4.18	2.25	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	20.00	6.44	4.18	2.25	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.06	6.44	4.18	2.25	3.38	1.12	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	20.00	6.44	4.18	2.25	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	13.96	6.44	4.18	2.25	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	13.96	6.44	4.18	2.25	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	10.00	6.44	4.18	2.25	0.00	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-11c
LaGrange Emergency Scenario Evaluation: 2050

				Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)[3]					
Risk	**Scenario**	**Relative Liklihood**	**Duration (Days)**	**LaGrange WTP**	**West Point Lake**	**Maximum Possible Purchased Water (MGD)**	**Water Storage (MGD)[4]**	**Total Possible Water Supply (MGD)**	**Capacity Loss (MGD)**	**Available Water Supply (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	20.00	22.00	NA	3.06	23.06	4.00	19.06
	A2. Critical asset failure at largest WTP[2]	0.1	30	20.00	22.00	NA	NA	20.00	0.00	20.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	20.00	22.00	NA	3.06	23.06	20.00	3.06
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	20.00	22.00	NA	NA	20.00	0.00	20.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source[5]	0.5	1	20.00	22.00	NA	3.96	23.96	10.00	13.96
	D2. Chemical contamination of largest raw water source[5]	0.1	1	20.00	22.00	NA	3.96	23.96	10.00	13.96
E. Full unavailability of major raw water sources due to federal or state government actions	--					Not Applicable				
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--					Not Applicable				
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment[5]	0.05	30	20.00	22.00	NA	NA	20.00	10.00	10.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought					Not Applicable[6]				

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. The WTP has a generator of unknown capacity, so 20% capacity loss was assumed.
2. The WTP met chemical and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
5. LaGrange WTP has a 12 MG raw water reservoir in addition to pumping from West Point Lake. If West Point Lake is contaminated or if the dam fails, 10 MGD capacity loss was assumed.
6. West Point Lake is in Hydrologic Unit Code-10 "Yellowjacket Creek," which is greater than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-11d
LaGrange Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	19.06	11.71	7.61	4.10	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	20.00	11.71	7.61	4.10	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.06	11.71	7.61	4.10	8.65	4.55	1.04
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	20.00	11.71	7.61	4.10	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	13.96	11.71	7.61	4.10	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	13.96	11.71	7.61	4.10	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	10.00	11.71	7.61	4.10	1.71	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-12a
Tallapoosa Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[1]	0.1	1	2.57	1.80	4.37	1.76	2.61
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice[2]	1	3	2.57	NA	2.57	0.00	2.57
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. It was assumed that the largest interconnection fails.
2. It was assumed that the interconnections can supply full capacity.
3. Tallapoosa's four interconnections with Haralson County are limited by their permit withdrawal limits and 2015 ADD. The maximum possible purchased water value was calculated as the supplier's 2015 ADD subtracted from the supplier's permitted withdrawal limit.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-12b
Tallapoosa Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	2.61	0.57	0.37	0.20	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	2.57	0.57	0.37	0.20	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-12c
Tallapoosa Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[1]	0.1	1	3.07	1.80	4.87	1.76	3.11
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice[2]	1	3	3.07	NA	3.07	0.00	3.07
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. It was assumed that the largest interconnection fails.
2. It was assumed that the interconnections can supply full capacity.
3. Tallapoosa's four interconnections with Haralson County are limited by their permit withdrawal limits and 2015 ADD. The maximum possible purchased water value was calculated as the supplier's 2015 ADD subtracted from the supplier's permitted withdrawal limit.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-12d
Tallapoosa Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	3.11	0.29	0.19	0.10	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	3.07	0.29	0.19	0.10	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-12e
Tallapoosa Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)
31	GA1430007-Haralson County	GA-100 North	10	5	2.727	1.763	0.143	1.763
32	GA1430007-Haralson County	US-78 West	8	5	1.745	1.128	0.143	1.128
33	GA1430007-Haralson County	US-78 East	8	5	1.745	1.128	0.143	1.128
34	GA1430007-Haralson County	GA-100 South	8	5	1.745	1.128	0.143	1.128

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.

Table B-13a
Temple Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[1]	0.1	1	7.05	0.10	7.15	1.76	5.38
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice[2]	1	3	7.05	NA	7.05	0.00	7.05
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. It was assumed that the largest interconnection fails.
2. It was assumed that the interconnections can supply full capacity.
3. Temple's interconnections with Carroll County and Haralson County are not limited by their permit withdrawal limits.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-13b
Temple Deficits: 2015

Risk	Scenario	Available Water Supply (MGD)	2015 - Immediate Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	5.38	0.29	0.19	0.10	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	7.05	0.29	0.19	0.10	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-13c
Temple Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Maximum Possible Purchased Water (MGD)[3]	Water Storage (MGD)[4]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)[1]	0.1	1	3.83	0.10	3.93	1.76	2.17
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice[2]	1	3	3.83	NA	3.83	0.00	3.83
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. It was assumed that the largest interconnection fails.
2. It was assumed that the interconnections can supply full capacity.
3. Temple's interconnection with Haralson County is not limited, but their four interconnections with Carroll County are limited by Carroll County's permit withdrawal limits and 2050 ADD. The maximum possible purchased water value was calculated as the Haralson County interconnection plus Carroll County's 2050 ADD subtracted from their permitted withdrawal limit.
4. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-13d
Temple Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target			Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)			
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	Not Applicable						
	A2. Critical asset failure at largest WTP	Not Applicable						
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	2.17	0.86	0.56	0.30	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	3.83	0.86	0.56	0.30	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	Not Applicable						
	D2. Chemical contamination of largest raw water source	Not Applicable						
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-13e
Temple Interconnections

Existing Incoming Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)[2]	Maximum Possible Purchased Water (MGD)
35	GA0450001-Carroll County	Bar J Road	10	5	2.727	1.763	0.074	1.763
36	GA0450001-Carroll County	Taylors Gin Road	10	5	2.727	1.763	0.074	1.763
37	GA0450001-Carroll County	Rainey Road	unknown	unknown	unknown	unknown	0.074	unknown
38	GA0450001-Carroll County	I-20	10	5	2.727	1.763	0.074	1.763
39	GA1430007-Haralson County	US-78 West	10	5	2.727	1.763	0.000	1.763

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.
2. The daily capacity (0.29 MGD) was assumed to be distributed equally among the four Carroll County interconnections.

Table B-14a
Villa Rica Emergency Scenario Evaluation: 2015

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)[3]					
				Franklin Smith WTP	Lake Fashion and Cowan's Lake	Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.50	1.50	6.20	1.55	9.25	0.00	9.25
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.50	1.50	6.20	NA	7.70	1.50	6.20
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.50	1.50	6.20	1.55	9.25	1.50	7.75
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.50	1.50	6.20	NA	7.70	0.00	7.70
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source[6]	0.5	1	1.50	1.50	6.20	1.76	9.46	1.00	8.46
	D2. Chemical contamination of largest raw water source[6]	0.1	1	1.50	1.50	6.20	1.76	9.46	1.00	8.46
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment[6]	0.05	30	1.50	1.50	6.20	NA	7.70	1.00	6.70
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[7]								

Notes:

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. A backup generator is able to supply full capacity, rendering no capacity loss.
2. Did not meet unit process redundancy for coagulation units, flocculation units, and clarification units, rendering full capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. The interconnections with Carroll County and Douglasville-Douglas County are not limited by their permit withdrawal limits.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
6. Villa Rica can withdraw from two reservoirs (one has 1.5 MGD capacity, one has 0.5 MGD capacity). If the larger one is contaminated or if the dam fails, 1 MGD capacity loss was assumed.
7. Villa Rica's reservoirs are in Hydrologic Unit Code-10 "Buck Creek-Little Tallapoosa River," which is greater than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-14b
Villa Rica Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	9.25	1.56	1.01	0.54	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	6.20	1.56	1.01	0.54	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	7.75	1.56	1.01	0.54	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	7.70	1.56	1.01	0.54	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	8.46	1.56	1.01	0.54	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	8.46	1.56	1.01	0.54	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	6.70	1.56	1.01	0.54	0.00	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 02/01/21

Table B-14c
Villa Rica Emergency Scenario Evaluation: 2050

Risk	Scenario	Relative Liklihood	Duration (Days)	Peak Day Design Capacity (MGD) Franklin Smith WTP	Peak Permitted Withdrawal (MGD-24-hour maximum)[3] Lake Fashion and Cowan's Lake	Maximum Possible Purchased Water (MGD)[4]	Water Storage (MGD)[5]	Total Possible Water Supply (MGD)	Capacity Loss (MGD)	Available Water Supply (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	1.50	1.50	5.08	1.55	8.13	0.00	8.13
	A2. Critical asset failure at largest WTP[2]	0.1	30	1.50	1.50	5.08	NA	6.58	1.50	5.08
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	1.50	1.50	5.08	1.55	8.13	1.50	6.63
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	1.50	1.50	5.08	NA	6.58	0.00	6.58
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source[6]	0.5	1	1.50	1.50	5.08	1.76	8.34	1.00	7.34
	D2. Chemical contamination of largest raw water source[6]	0.1	1	1.50	1.50	5.08	1.76	8.34	1.00	7.34
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment[6]	0.05	30	1.50	1.50	5.08	NA	6.58	1.00	5.58
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[7]								

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 02/01/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. One backup generator is able to supply full capacity, rendering no capacity loss.
2. Did not meet unit process redundancy for coagulation units, flocculation units, and clarification units, rendering full capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. The interconnections with Carroll County are limited by their permit withdrawal limits and 2050 ADD. The maximum possible purchased water value was calculated as the Douglasville-Douglas County interconnections plus Carroll County's 2050 ADD subtracted from their permitted withdrawal limit.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage. Villa Rica indicated a new storage tank of unknown capacity.
6. Villa Rica can withdraw from two reservoirs (one has 1.5 MGD capacity, one has 0.5 MGD capacity). If the larger one is contaminated or if the dam fails, 1 MGD capacity loss was assumed.
7. Villa Rica's reservoirs are in Hydrologic Unit Code-10 "Buck Creek-Little Tallapoosa River," which is greater than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-14d
Villa Rica Deficits: 2050

			2050 - Long-Range Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	8.13	2.95	1.92	1.03	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	5.08	2.95	1.92	1.03	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	6.63	2.95	1.92	1.03	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	6.58	2.95	1.92	1.03	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	7.34	2.95	1.92	1.03	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	7.34	2.95	1.92	1.03	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	5.58	2.95	1.92	1.03	0.00	0.00	0.00
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 02/01/21

Table B-14e
Villa Rica Interconnections

Existing Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[2]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)[3]	Maximum Possible Purchased Water (MGD)
40	GA0450001-Carroll County	At Villa Rica Water Treatment Plant	6	5	0.982	0.635	0.325	0.635
41	GA0450001-Carroll County	Highway 61	12	5	3.927	2.538	0.325	2.538
42	GA0970000-Douglasville-Douglas County[1]	Conners Road	10	5	2.727	1.763	0.000	1.763
43	GA0970000-Douglasville-Douglas County[1]	Highway 61	6	5	0.982	0.635	0.000	0.635
44	GA0970000-Douglasville-Douglas County[1]	Highway 78	6	5	0.982	0.635	0.000	0.635

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The system's permits and ADD were not obtained. Therefore, these are assumed values based on pipe diameter and may be in excess of what the system can functionally provide.
2. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.
3. Purchased water (0.65 MGD) was assumed to be distributed equally between the two Carroll County interconnections.

Table B-15a
West Point Emergency Scenario Evaluation: 2015

				Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)[3]					
Risk	**Scenario**	**Relative Liklihood**	**Duration (Days)**	**West Point WTP**	**Chattahoochee River**	**Maximum Possible Purchased Water (MGD)[4]**	**Water Storage (MGD)[5]**	**Total Possible Water Supply (MGD)**	**Capacity Loss (MGD)**	**Available Water Supply (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	4.20	2.10	2.54	1.94	6.57	0.00	6.57
	A2. Critical asset failure at largest WTP[2]	0.1	30	4.20	2.10	2.54	NA	4.64	0.00	4.64
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	4.20	2.10	2.54	1.94	6.57	2.10	4.47
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	4.20	2.10	2.54	NA	4.64	0.00	4.64
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	4.20	2.10	2.54	2.24	6.87	2.10	4.77
	D2. Chemical contamination of largest raw water source	0.1	1	4.20	2.10	2.54	2.24	6.87	2.10	4.77
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment[6]	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[7]								

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. A backup generator is able to supply full capacity, rendering no capacity loss.
2. The WTP met chemical and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. The interconnection with LaGrange is not limited by their permit withdrawal limits.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
6. They do not have an impoundment.
7. The Chattahoochee River at the withdrawal point is Strahler Stream Order 6 (a major river) and in Hydrologic Unit Code-10 "Long Cane Creek-Chattahoochee River," which is greater than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-15b
West Point Deficits: 2015

			2015 - Immediate Reliability Target					
Risk	**Scenario**	**Available Water Supply (MGD)**	**Total Demand (MGD)[1]**	**65% ADD (MGD)**	**35% ADD (MGD)**	**Total Demand Deficit (MGD)**	**65% ADD Deficit (MGD)**	**35% ADD Deficit (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	6.57	1.15	0.75	0.40	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	4.64	1.15	0.75	0.40	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	4.47	1.15	0.75	0.40	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	4.64	1.15	0.75	0.40	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	4.77	1.15	0.75	0.40	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	4.77	1.15	0.75	0.40	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-15c
West Point Emergency Scenario Evaluation: 2050

				Peak Day Design Capacity (MGD)	Peak Permitted Withdrawal (MGD-24-hour maximum)[3]					
Risk	**Scenario**	**Relative Liklihood**	**Duration (Days)**	**West Point WTP**	**Chattahoochee River**	**Maximum Possible Purchased Water (MGD)[4]**	**Water Storage (MGD)[5]**	**Total Possible Water Supply (MGD)**	**Capacity Loss (MGD)**	**Available Water Supply (MGD)**
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP[1]	0.5	1	4.20	2.10	2.54	1.94	6.57	0.00	6.57
	A2. Critical asset failure at largest WTP[2]	0.1	30	4.20	2.10	2.54	NA	4.64	0.00	4.64
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	0.1	1	4.20	2.10	2.54	1.94	6.57	2.10	4.47
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	1	3	4.20	2.10	2.54	NA	4.64	0.00	4.64
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	0.5	1	4.20	2.10	2.54	2.24	6.87	2.10	4.77
	D2. Chemical contamination of largest raw water source	0.1	1	4.20	2.10	2.54	2.24	6.87	2.10	4.77
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable								
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment[6]	Not Applicable								
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable[7]								

Notes:

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

ADD - average daily demand
MGD - million gallons per day
NA - not applicable
QWS - qualified water system
WTP - water treatment plant

1. A backup generator is able to supply full capacity, rendering no capacity loss.
2. The WTP met chemical and unit process redundancy, rendering no capacity loss.
3. The smaller of the peak day design capacity and the peak permitted withdrawal value was selected for the total possible water supply calculation.
4. The interconnection with LaGrange is not limited by their permit withdrawal limits.
5. Scenarios A1 and B include treated water storage; Scenarios D1 and D2 include raw (non-reservoir) and treated water storage.
6. They do not have an impoundment.
7. The Chattahoochee River at the withdrawal point is Strahler Stream Order 6 (a major river) and in Hydrologic Unit Code-10 "Long Cane Creek-Chattahoochee River," which is greater than 100 square miles.

Relative liklihood scale: 1 = high; 0.5 = medium; 0.1 = low; 0.05 = negligible

Table B-15d
West Point Deficits: 2050

Risk	Scenario	Available Water Supply (MGD)	2050 - Long-Range Reliability Target					
			Total Demand (MGD)[1]	65% ADD (MGD)	35% ADD (MGD)	Total Demand Deficit (MGD)	65% ADD Deficit (MGD)	35% ADD Deficit (MGD)
A. Failure of largest water treatment facility	A1. Power supply failure of largest WTP	6.57	1.47	0.96	0.51	0.00	0.00	0.00
	A2. Critical asset failure at largest WTP	4.64	1.47	0.96	0.51	0.00	0.00	0.00
B. Short-term catastrophic failure of a water distribution system	Critical asset failure (transmission main)	4.47	1.47	0.96	0.51	0.00	0.00	0.00
C. Short-term contamination of a water supply within distribution system	Contamination of distribution system triggers issuance of boil water notice	4.64	1.47	0.96	0.51	0.00	0.00	0.00
D. Short-term contamination of a raw water source	D1. Biological contamination of largest raw water source	4.77	1.47	0.96	0.51	0.00	0.00	0.00
	D2. Chemical contamination of largest raw water source	4.77	1.47	0.96	0.51	0.00	0.00	0.00
E. Full unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
F. Limited or reduced unavailability of major raw water sources due to federal or state government actions	--	Not Applicable						
G. Failure of an existing dam that impounds a raw water source	Dam failure for largest impoundment	Not Applicable						
H. Water supply reduction due to drought	Raw water supply available is 40% of ADD due to drought	Not Applicable						

Notes:

ADD - average daily demand
MGD - million gallons per day
QWS - qualified water system
WTP - water treatment plant

1. Total demand (withdrawal plus purchases) is defined the same as 100% ADD.

Prepared by: GJH 02/22/21
Checked by: LCT 03/05/21

Table B-15e
West Point Interconnections

Existing Interconnections

Number	System	Description	Diameter (in)	Maximum Velocity (fps)[1]	Maximum Flow (cfs)	Maximum Flow (MGD)	Capacity Already Purchased (MGD)	Maximum Possible Purchased Water (MGD)[2]
45	GA2850001-LaGrange	North Side of West Point	12	5	3.927	2.538	0.009	2.538
46	AL0000179-Lanett	W. Point Road	unknown	unknown	unknown	unknown	0.000	unknown

Prepared by: GJH 02/22/21
Checked by: LCT 02/01/21

Notes:
in - inches
fps - feet per second
cfs - cubic feet per second
MGD - million gallons per day
1. The maximum velocity is assumed to be 3 fps for pipe diameters greater than or equal to 16 inches and 5 fps for pipe diameters less than or equal to 12 inches.
2. This value, which is conservative, was obtained from LaGrange.

Appendix C: Sensitivity Analysis

Contents

Acronyms

GEFA	Georgia Environmental Finance Authority
QWS	Qualified Water System(s)

1.0 Introduction

This appendix describes the sensitivity analysis that was conducted to test the influence of criterion weightings on the initial manual rank outcome.

2.0 Sensitivity Analysis

As described in Section 7.1 of the report, scores were assigned either 1, 2, 3, or 4 using a methodology shown in Table 7-1. Criterion weights were initially assigned either 1, 2, or 3 based on professional judgement. Recall that Project 2 and Project 3 tied across each decision metric. Therefore, each of their manual ranks is 3 and there is no rank 4. In the sensitivity analysis, these two project ranks were also the same under each weighting adjustment.

To conduct the sensitivity analysis, scenarios were considered to test the influence of criterion weightings on the rank outcome. First, all criteria were assigned the highest weight (3). The effect of this weighting adjustment is equivalent to the absolute score because although it amplified score values, the rank outcome was the same. Second, one of the eight criteria was assigned the highest weight (3) with the remaining seven criteria assigned the lowest weight (1). The effects of these weighting variations are described below:

1. Systems Benefitted weight = 3; all other criteria weights = 1
    a. Interconnection Project 1 improved rank by three ranks.
    b. Interconnection Projects 2, 3, and 7 worsened rank by one rank.
    c. Interpretation: this weighting adjustment yielded the same outcome as the unweighted scenario. It is expected that Project 7 (LaGrange) should worsen rank because higher priority is given to projects that benefit multiple systems.
2. Population Benefitted weight = 3; all other criteria weights = 1
    a. Interconnection Project 1 improved rank by three ranks.
    b. Interconnection Projects 2, 3, and 7 worsened rank by one rank.
    c. Interpretation: this weighting adjustment yielded the same outcome as the unweighted scenario. It is expected that Project 7 (LaGrange) should worsen rank because higher priority is given to projects that benefit larger populations.
3. Critical Scenario Duration (days) weight = 3; all other criteria weights = 1
    a. Interconnection Project 1 improved rank by three ranks.
    b. Interconnection Projects 2, 3, and 7 worsened rank by one rank.
    c. Interpretation: this weighting adjustment yielded the same outcome as the unweighted scenario. It is expected that Project 1 (Bowdon-Carroll County) should improve rank because higher priority is given to projects that aid longer critical scenario durations.
4. Added Capacity as a Percent of Total Demand (%) weight = 3; all other criteria weights = 1
    a. Interconnection Project 1 improved rank by three ranks.
    b. Interconnection Projects 2, 3, and 7 worsened rank by one rank.
    c. Interpretation: this weighting adjustment yielded the same outcome as the unweighted scenario. Projects 2, 3, and 7 have a relatively small added capacity as a percent of total demand, whereas Project 1 has a larger added capacity as a percent of total demand for Bowdon.
5. Cost ($) weight = 3; all other criteria weights = 1

   a. Interconnection Project 1 improved rank by three ranks and Project 7 improved rank by one rank.
   b. Interconnection Projects 2 and 3 worsened rank by two ranks.
   c. Interpretation: it is expected that under this weighting adjustment, priority is given to less expensive Projects 1 and 7.
6. Potential Environmental Impacts weight = 3; all other criteria weights = 1
   a. Interconnection Project 6 improved rank by one rank.
   b. Interconnection Project 1 worsened rank by one rank.
   c. Interpretation: this weighting adjustment worsened Project 1 because of a stream crossing. This rank change caused Project 6 to switch rank order with Project 1.
7. Potential System and Community Impacts weight = 3; all other criteria weights = 1
   a. Interconnection Project 1 improved rank by three ranks.
   b. Interconnection Projects 2, 3, and 7 worsened rank by one rank.
   c. Interpretation: this weighting adjustment yielded the same outcome as the unweighted scenario. Because the projects that changed rank have similar community impact scores, it is suspected that the rank changes are driven by other criteria.
8. Excess Capacity Index weight = 3; all other criteria weights = 1
   a. Interconnection Project 1 improved rank by three ranks.
   b. Interconnection Projects 2, 3, and 7 worsened rank by one rank.
   c. Interpretation: this weighting adjustment yielded the same outcome as the unweighted scenario. It is expected that Project 1 (Bowdon-Carroll County) should improve rank because Bowdon has no 2050 excess capacity.

The sensitivity analysis results demonstrate that each criterion is generally insensitive to weighting. Rather, Project 1 (Bowdon-Carroll County) is somewhat sensitive to weighting. This sensitivity is driven by Criterion 6, the only criterion weighting adjustment that worsened Project 1's rank order because of a stream crossing. By decreasing the weight of Criterion 6 from three to two, the weighted score rank order matches the absolute score rank order. Regardless, initially assigned weights were retained because sensitivity analysis results are meant to be informative rather than correctional.